



Table of Contents

1. Curriculum Vitae of Dr. Willis Weight
2. Fairview Neighbors Association participants who are not attending.
3. Proposed Findings of Fact

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President – WDW Writing Consulting & Planning INC
3781 Yuhas St. Helena, MT 59602

Educational Experience

Department of Mathematics, Engineering,
& Computer Science
Carroll College, Helena, MT 59625

RANK

2008 -- 2019 Professor of Engineering, Carroll College (**Retired December 18, 2019**)
2008 Professor Emeritus of Geological Engineering after 20 years of service at Montana Tech
1997 Professor of Geological Engineering, Montana Tech of the University of Montana
1993 Associate Professor, Geological Engineering, Montana College of Mineral Science and Technology.
1989 Assistant Professor, Geological Engineering, Montana College of Mineral Science and Technology.
1988 Lecturer – University of Wyoming, taught Physical Geology and Lab (summer 1988, 3 cr.), Intro to Geology (fall 1988, 2 cr. 263 students)

EDUCATION

1989 Ph.D. Mathematical Geology University of Wyoming.
1980 B.S. Engineering Geology Brigham Young University.

ACADEMIC AND PROFESSIONAL APPOINTMENTS

Jan 2016 – Mar 2016	Adjunct Professor at the California Polytechnic State University, Dept. of Civil & Environmental Engineering in San Luis Obispo, CA. Taught Engineering Hydrology (CE 435) while on sabbatical leave.
Aug 2011 – 2014	Director of Environmental Studies at Carroll College.
Jan 2009 - present	Professor of Engineering in the Department of Engineering, Mathematics, and Computer Science at Carroll College. Faculty advisor for Engineers Without Borders (EWB) - Carroll Student Chapter, Guatemala Project.
Jan 2007 – May 2007	Adjunct Professor at Carroll College in Helena, Montana. Taught a hydrogeology course while on sabbatical leave.
June 1996- Dec 2008	Head, Hydrogeology Program at Montana Tech of the University of Montana.
July 1991 - June 1996	Department Head, Department of Geological Engineering,
May - Dec, 1988	Instructor, University of Wyoming, Laramie, Intro. to Geology, (260 students); Physical Geology, (37 students)
Jan 1989 – Present	President of WDW Writing, Consulting & Planning INC, where I have performed consulting in Montana in a variety of applications.
March 1982 - August 1985	Mine Geologist, Kiewit Mining & Engineering Co., Sheridan, Wyoming. Mine geologist for Big Horn Coal Co. Performed consulting mine-development work, including two months overseas in the Peoples Republic of China. Logged over 100,000 feet of drill holes and wells.
July 1980 - March 1982	Hydrogeologist, Peter Kiewit Sons', Omaha, NE. Responsible for field and permit work for geology and hydrology of Cumberland Coal Co. and Rosebud Coal Sales Co., WY, .
Summers of 1978, 1979	Hydrologic Field Assistant, U.S. Geological Survey, WRD, Idaho Falls, ID. under Jack Barraclough. Performed data collection

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from water wells, analysis of data on the migration of radio-nuclides from buried nuclear waste at the Idaho National Engineering Laboratory. Assisted in pumping tests performed on a 10,360-foot-deep geothermal test well INEL 1.

CONSULTING & RESEARCH

Jun 2020 – Aug 2020	Hired by Mark Johnson MD of the Fairview Neighborhood Association to provide technical expertise to oppose a proposed subdivision- Rolling Acres – consisting of 114 acres, 77 lots, and 41 shared wells. The property borders rural residential, conservation easement next to the Flathead River, and agricultural lands. A site visit was conducted in July and expert report with oral arguments were made before the planning committee in August. Worked with McGarvey Law, Kalispell.
May 2020 – Jun 2020	Was Hired by Lund Law of Bozeman MT to perform an aquifer test for the Rocking C Ranch located along the Smith River in Meagher County. They are performing a change application to reduce the use of five wells to one well for public water supply. Aquifer test plan was approved with variance letter from Lewistown DNRC.
Jun 2019 – Present	Hired by Mikel Siemens of Core Water Consulting LLC in Kalispell, MT to provide an analysis of aquifer test data from the Wettington Well #3 that was conducted in December 2015 to assess dependability as a Public Supply Well for a subdivision.
Jun 2019	Hired by Montana Section President of the American Water Resources Association to teach a 4-day course with Aquaveo's GMS software on: Groundwater Flow & Transport Modeling With GMS. Attendees were from Helena, Butte and Missoula from the DRNC, DEQ, Hydrometrics INC. and Morrison Maierle INC. June 11 – 14, 2019
Mar 2019 – Jan 2020	Hired by Water for Flathead's Future (WFF) to continue the Simplified Layer Model (SLM model) initiated in 2017 to expand over the entire Kalispell valley from Whitefish Lake to Flathead Lake. Completed a calibrated model using >550 boreholes and >900 cross-sections to create solids and used PEST and Pilot Points to calibrate the model.
Jan 2019 – Nov 2019	Initiated a contract with Aquaveo LLC of Provo UT (GMS software) and the Helena DNRC to construct two numerical groundwater flow models. One is in the Billings-Laurel Corridor and the other is for the Kalispell Valley. My role is as an advisor and model designer. I constructed a 5-Layer uncalibrated model working with Aquaveo for the Kalispell Valley.
Sep 2018	Conducted a public health undergraduate research study of Spring Meadow Lake; including water sample collection, plating of samples on MacConkey agar, incubation and colony counts. It was determined that the E. Coli counts were above the risk level of 126 CFU/100ml and that the public was at risk for swimming the week after Labor Day 2018.
Jan 2018 – Jan 2019	Was hired by Hertha Lund of Lund Law in Bozeman, MT to provide opinion about the impacts of late 2016 utility work performed by Northwestern Energy at the residence of Debra Tysse and George Cobb of Bozeman MT. The Tysse/Cobb residence experienced flooding in the crawl space after the Canal began flowing during the 2017 spring and summer irrigation season. A field visit was conducted in April 2018. This case settled out of court.
Sep 2017 – Present	Was hired by Hertha Lund of Lund Law in Bozeman, MT to provide technical assistance for the Fred Colver Ranch north of Lewistown, MT. Current operations include pumping irrigation waters from a pit close to Warm Springs Creek. Performed Aquifer test and analysis in Oct 2017 and June 2018. Resulted in preliminary decision to Grant the permit May 2020.
Apr 2017 – Dec 2018	Signed a publishing contract with McGraw-Hill Education to provide a

Jan 2017 – March 2019

manuscript for the 3rd Edition of my field hydrogeology book. The 3rd Edition is entitled ***Practical Hydrogeology: Principles and Field Applications, 3rd Edition***. The work was completed December 2018. Hired by *Water For Flathead's Future* (WFFF) to provide expert testimony and numerical groundwater modeling in opposition to a proposed water bottling plant designed to pump and bottle drinking water from the aquifer system in Kalispell, Montana. My opinion includes the most detailed geologic model of the Flathead valley known and a numerical groundwater flow model over the same area. Was part of an elite team including: Dr.'s Shlomo Nueman, Tom Maddock and Tom Meyers. A 3-day hearing took place in Kalispell, MT in Sept. 2017. The DNRC hearing examiner ruled in favor of the applicant; however, this case won in District Court in March 2019. It was appealed by the clients and DNRC to the Montana Supreme court who remanded the case back to District Court in May 2020.

Nov 2016 – Jan 2018

Contacted by *Stageline Flats* of Townsend, MT, a group of landowners with concerns of irrigation impacts from the 71 Ranch. Seventy-one sections of land are proposed to be irrigated via center pivot wells east of Canyon Ferry. Concerns are from pumping that may cause adverse effects to existing well owners. The developers have reconsidered their plans.

Apr 2016 – Jun 2018

Hired by Dan and Laura Boyce of Winifred, MT to assist them with aquifer testing required by a water-use permit in application for an irrigation beneficial use. Site conditions are wells extend down into the 3rd Cat Creek of the Cretaceous Kootenai Formation at depths exceeding 3000 feet. Artesian conditions prevail with shut in pressures exceeding 100 psi. A well-yield test was conducted in Sept. 2017 and paperwork followed leading to a water-use permit.

Apr 2016 – June 2017

Hired by Abigail St. Lawrence of Bloomquist Law Firm to provide expert testimony regarding a numerical model performed by the DNRC. At issue was the preliminary decision to deny a water-use permit for the Indian Springs Ranch and Indian Springs RV Park. I was hired to evaluate the numerical model and to provide any additional testimony. A site visit was conducted in May 2016. Expert Testimony was provided at a DNRC Hearing in June 2016.

Oct 2015 – Nov 2017

Hired by Walter Schweitzer of Geyser, MT to perform an aquifer test as part of the water-use permit process for irrigation. Aquifer testing was performed in November 2015 after an aquifer test plan was approved. A hydrogeologic report was prepared. The source aquifer was in the confined Cretaceous Kootenai Formation. Given the requirement to supply information about depletion to surface waters (DNRC suggested Hay Creek), field efforts included stream gauging of Hay Creek and providing other information. The Schweitzer's backed out of the application process for now being discourage about the process.

Nov 2016 – May 2016

Conducted an undergraduate research project to study the question about health impacts from coal trains passing through Helena MT. Led a group of students in evaluating coal dust captured by snow between Nov 2016 and Feb 2017, using laboratory technics and worked with Dr. Kelly Dorsi of Bison Engineering to determine the fraction of < 10 micron PM.

Mar 2015 – Oct 2015

Conducted an undergraduate research project in cooperation with Lewis & Clark County, and the Montana DEQ regarding elevated nitrates, arsenic, and uranium in a residential area west of Helena. Supervised water-sample collection and guided geologic interpretation. Two sampling events have taken place (March and September 2015) Results indicate elevated Arsenic and Uranium and Nitrates.

Oct 2014 – March 2015

Hired by Bjorne Boyer of Lund-Law in Bozeman, MT to provide expert testimony regarding the Springhill Reserve Subdivision, Bozeman

Sep 2014 – Dec 2015	<p>Montana.</p> <p>Invited by attorneys Hertha Lund and Dennis Lopach to provide expertise in writing a whitepaper concerning the questions that Montana should ask about the controversial practice of Fracking and its impact to Montana's waters and air quality.</p>
Jun 2014	<p>Hired by Ecoterra Environmental Services President Jorge Chirpas to provide groundwater modeling training for 25 Pemex Oil employees in San Luis Potosi, Mexico at the Institute of Technology. The title was "Modeling Groundwater Flow and Transport Using GMS". I teamed up with Alan Lemon of Aquaveo to provide the training and materials. It was a 5-day short course from Jun.22 – 27, 2014.</p>
Feb 2014 – Sep 2014	<p>Hired by Holly Franz of Helena, MT to provide expert testimony concerning litigation of Charles Fellows against a list of defendants; including the Teton Cooperative Reservoir Company. This is ongoing and I was deposed in July 2014.</p>
Oct 2013 – Feb 2015	<p>Hired by Aquaveo of Provo Utah (GMS software) to assist them with a large numerical visualization project covering 10 counties of the Ogallala Aquifer in the northern pan-handle of Texas. My responsibilities are specific to the development of the conceptual model and to provide guidance with the hydrostratigraphic interpretation. This included training and guidance on identifying formational contacts in the approximately 14,900 drill logs used and writing the geology sections. The client is the North Plains Groundwater Conservation District.</p>
Nov 2013 – Present	<p>Hired by Dan DeBuff of Shawmut, MT to perform a geologic and hydrogeologic investigation of the water development potential of his property. Preliminary field trip, aquifer test data analysis, and field survey conducted in December 2013. Additional aquifer testing occurred in Sept 2014 and in Nov 2015. A large test with four pumping wells and four observation wells with production exceeding 1500 gpm was conducted. Additional reports to address depletion have also been prepared. A water-use permit was applied for permit and denied, which led to a show-cause hearing in Nov 2018. The process was appealed through the Water Court in August 2019, and ruled in our favor. The DNRC is appealing to the Supreme Court.</p>
Aug 2013	<p>Invited by Pemex Oil and Ecoterra to participate in their 7th International Seminar of Emergency Response, Characterization and Remediation of Sites Impacted by Hydrocarbons. This is my third invitation in a row to this international seminar.</p>
May 2013 – Aug 2013	<p>Hired by Dave Baldwin of Water Right solutions Inc. of Helena MT to provide an opinion of the technical work performed by the WMG group. WMG is representing the Sill Ranch for a water-right application near Valier MT. Holly Franz was the attorney representing the objectors. Expert Testimony was provided in a water-right hearing in Helena August 2013 in behalf of the objectors. We won the case, the permit was denied.</p>
Mar 2013 – Jul 2013	<p>Hired by Jeffrey McNabb, of McNabb Engineering of Bozeman, MT to perform oversight work on two aquifer tests conducted for the Royal Teton Ranch near Gardiner MT. One production well was for potable water while the other was to be used to blend with their hot water source. Analysis of the data and summary results for the water-right applications were performed.</p>
Oct 2012	<p>Hired by the Church Universal and Triumphant, John Springer V.P. to be their technical representative at meeting in Gardiner, MT with the Greater Yellowstone Coalition regarding their project of using thermal spring water from LaDuke hot springs. Expert testimony was provided and issues regarding natural flow were resolved.</p>
Sep 2012 – April 2016	<p>Hired by attorney Wade DaHood of Anaconda, MT to investigate the formation of a sinkhole in the yard of Charlene Preston of Butte MT. A</p>

field investigation was conducted in Sept 2012 and report prepared. Follow-up field work (monitoring wells, surveying, and lab work) with another report generated in Sept 2013. Additional site visits and observations in July 2014. Initial settlement took place with the MT DOT. I was deposed in Feb 2015 regarding this case by attorneys from NW Energy and Butte Silver Bow. This case settled with NW Energy out of court.

Aug 2012 – Nov 2017 Hired by Dan Flaherty of Great Falls to evaluate impacts of the City of GF in installing a drain system to a client nearby. The client apparently lost use of the well from the City's project. I performed a field investigation and provided an opinion. Depositions were conducted in Oct. 2017 and the Case settled out of court.

Mar 2012 Hired by Jorge Chirpries manager of Ecoterra Environmental Engineering Services in Mexico City to provide training in groundwater flow and contaminant transport for 24 of their employees. This course was team taught with Allen Lemon, principle international instructor and developer of groundwater Modeling Systems (GMS) for Aquaveo, a software Co. of Salt Lake City.

Sep 2011 – May 2017 Hired by VP of Carroll College Tom McCarvel to assist with understanding and seeking a permit for additional irrigation water for the college. Included directing aquifer tests with students and being the liaison with permit work.

May 2011 – June 2013 Hired by Kurt Hafferman PE and President of Billmayer & Hafferman INC of Kalispell, MT to provide opinion about impacts of a geothermal heating/cooling system, designed for the Kalispell Regional Medical Center. Concerns were expressed by the City of Kalispell represented by Applied Water Consulting about thermal impacts to a public water supply well. My opinion includes providing a 23-layer transient numerical flow model to estimate the distribution of thermal impacts to the deep Kalispell aquifer. Drilling of the first injection well took place Aug. 2012, which I logged. Additional aquifer testing took place in Jan 2013 with subsequent modeling with new field information in Feb 2013. The concerns were resolved and this project was permitted in early 2014.

May 2011 – Jun 2011 Hired by Paul Trey of Bozeman, MT to assist with reallocating existing water rights among multiple parties. 118 acres near Three Forks have been divided up and a 650 GPM well and 220 acre-feet of volume are being divided up.

Jan 2011 – Mar 2011 Requested by the Allottees of the Crow Tribe to assist them with their water crisis. Tribal leadership took the 1999 water code and 2009 water Rights Settlement Act to Helena and formed the Crow Water Settlement Act of 2010. This was pushed forward with the help of Montana Senators Tester and Baucus, passed by Congress in November and signed by President Obama on December 8, 2010. Provided public testimony and answered questions Feb. 2011.

Sep 2010 – Dec 2010 Hired by Roger Noble, Senior hydrogeologist for Applied Water Consulting of Kalispell, MT to provide expert opinion concerning a tanker rollover gasoline spill near Polson MT along the shore of Flathead Lake. This case settled out of court.

Feb 2010 – July 2010 Hired by President of Hydrometrics Inc, Mike Wignot and attorney Kevin Funyac of Billings MT to represent them in Hydrometrics professional services associated with groundwater issues in Colstrip Montana and PPL's stream electric station. Worked with Al Hilty Billings Hydrometrics Inc. manager on questions in the field. This case settled out of court in July 2010.

Jan 2010 – May 2011 Hired by the Royal Teton Ranch to perform a yield analysis of a geothermal spring water right for development purposes. Worked with USFS and other entities to assist with permitting process. Successful

Dec 2009 – May 2012	72-hour drawdown test in May 2010. Provided in-house and public format reports. Hired by Creed Evans and Allen Beck Law offices of Lewistown, MT to provide expert testimony on drilling and completion conditions of a deep flowing artesian well near Utica MT. Case is in bankruptcy court as French vs. FX Drilling, where bankruptcy handled by Gary Deschenes of great Falls and water rights handled by Hertha Lund of Bozeman. Testimony at a water-right hearing took place June 2011.
Oct 2009 - present	Faculty advisor for Carroll EWB trip to Santo Tomas School, La Asuncion in Guatemala to perform assessment field work including evaluation of water supply and waste water system. Visits associated with this took place in May 2009, Oct 2009, and May 2010. Performed translation and preparing for future work. The first Implementation project took place in May 2012 where two structural retrofit walls were constructed with 8 students and local laborers. Additional walls have been constructed in Dec 2013, and January 2015, where I provide all logistical assistance.
Feb 2009 – Nov 2011	Hired by Horse Creek Water Users, Inc of Absorkee, MT to evaluate reports performed by Hydro Solutions of Billings, MT and the DNRC to assist with their efforts to gain a Controlled Groundwater Area status. Initially the DNRC opposed the technical interpretations but changed their minds in 2011. Testified at a hearing in Absorokee MT in Nov. 2011.
May 2008 – May 2009	Hired by Rob VanDeren (Open A Ranch) of Dillon as an expert to assist with an objection to a water-use permit sought by the Sitz Ranch also of Dillon. Worked with Hertha Lund Attorney with Wittich Law firm in Bozeman on the case. Case went to a hearing in Dillon in May 2009. Questions were provided for the attorney and I testified on the stand. We won this case.
Mar 2008 – Dec 2009	Hired by Roger Noble, Senior hydrogeologist for Applied Water Consulting of Kalispell, MT to help address objections to a water-use permit for the Prairie Nest Ranch in the Madison aquifer, objected by FWP and PPL Montana for potential impacts to Giant Springs in Great Falls. A numerical groundwater model was constructed Sep-Nov 2009 to address questions in preparation for a hearing. Worked with Attorney Harley Harris.
Mar 2008, 2009	Presented a short course "Geology and Hydrogeology for Drillers" for the Montana Board of Water Well Contractors in Helena, Montana. (25 drillers from all over the State came). This fulfills 4 CEU.s for the States of Montana, Nevada, and Washington.
Jan 2008	Hired by O'Keefe Drilling to prepare a short course to help drillers do better on their water-well contractor exam. The course "Geology and Hydrogeology for Drillers" was presented in Butte Montana
Spring 2007	Adjunct Professor in the Department of Math and Engineering. Taught Engineering 389: Hydrogeology, with eight students, including five professionals from consulting firms and State agencies.
Nov 2006 to Apr 2007	Hired by Margie Thomas of Butte Montana to provide expert witness services for a Dentist, Dan O'Neill whose public supply well is threatened by Class V injection wells from a neighboring property. Prepared an affidavit, estimated aquifer properties from soil samples, and evaluated the direction of groundwater flow. Provided oversight work during drilling and performed soil testing and numerical modeling in the evaluation.
Nov 2006 to Mar 2007	Prepared and taught 4 short courses for the Blackfoot Community College in Browning, Including: Intro. to Hydrogeology, Mining and the Environment, Innovative Technologies, and ArcGIS 9.2.
Nov 2006	Aug 2006 – Apr 2008 Hired by Jean Deming of Cardwell, MT to perform a field evaluation of a neighbors irrigation ditch leaking water onto her property from poor maintenance practices. A report was written. A second visit to the property was conducted to perform a water balance

analysis.

Jul 2006 Hired by Russell Larson of Wilsall, Montana to evaluate a slope failure on his property resulting from ditch leakage. A field investigation revealed leakage rates greater than 50% contributed to slope failure.

Apr 2006 Performed an evaluation of the Kennecott Minerals Company environmental baseline hydrology for the Yellow Dog project in the Upper Peninsula of Michigan for the Keweenaw Tribe.

Jan 2006 – Apr 2008 Hired by Bernie Jones of Three Forks, MT to perform all of the technical aspects for a water-use permit, including pumping tests, analysis of data, and technical report writing. The permit was for an irrigation well. Successful assistance through the mitigation process.

Oct 2005 Hired by Jerry Meine of Dillon Montana to assist with pumping test on an irrigation well and perform the data analysis and report of findings and recommendations.

Jun 2005 Was hired through technical outreach to evaluate Kennocott's proposed mine in the Kewanee's tribal lands near Marquette Michigan. Spent a day in field with "the river walker" and a day with tribal representatives and provided recommendations.

Mar 2005 Hired by Jerry Meine of Dillon Montana to design a 14-inch irrigation well and to perform pumping testing at the completion of the well. Successful permit.

Jan 2005 Was hired by Lenard Davis of Whitehall to prepare a water-use permit to meet the DNRC's 3.11 criteria and that of a closed groundwater basin. Permit successful.

Jan 2005 Taught a short course at Little Big Horn College and at Fort Belknap College on Innovative Technologies as part of Montana Tech's Brownfield's training grant.

May – Nov 2004 Hired by Mark Vucurovich, Attorney at Law, to serve as an expert witness on the Community Mutual Gas site in Butte, Montana. Performed field work, sample collection, analysis and numerical modeling. Was deposed twice. The judge dismissed the case.

Apr 2004 Performed pumping and recovery tests on a domestic well for Michael and Vicki Sullivan of Helena, Montana. Documentation was needed to mitigate disputes with realtors and other parties.

Mar – Aug 2004 Was hired by Spence Stoddard of Dillon, MT to assist with water use permit for two large capacity wells used for a pivot irrigation system. (Was second person to revise permits according to new regulations). Work required pumping tests, field measurements and technical analysis.

Jan 2004 Was invited to the North American Environmental Field Conference and Exposition to give a presentation and short course in Tampa Florida.

Jan 2004 Taught a 3-day short course at the Crow Reservation at Crow Agency, primarily for the 107 Elder Advisory group on *Introduction to Hydrogeology*

Dec 2003 Taught a 3-day short course at the Crow Reservation at Crow Agency, primarily for the 107 Elder Advisory group on *Environmental Planning for Small Communities*

Nov 2003 Was invited to give a presentation to the 107 Elder Advisory Meeting at Crow Agency on the connection between health and the environment.

June 2003 Worked with Lewis, Huppert, Slovak, and Kovacich, from Great Falls as an expert witness on the Burlington Northern and Santa Fe (BNSF) railroad site Havre, Montana. Performed fieldwork including: slug tests, product recovery tests, well installation, numerical groundwater flow and contaminant transport modeling, and expert testimony. I was deposed for 8 ½ hours by a BNSF attorney from Chicago. This case settled out of court.

Nov. 2002 Worked for Myra Shults of Lolo, Montana concerning the Liberty Cove

	<p>Addition, a 116 acre subdivision to be divided into 70 lots. A technical evaluation was conducted on the hydrogeology report and non-degradation analysis. An appearance to provide expert testimony at the county commissioner's meeting in Nov. 2002 resulted in a unanimous denial of the project.</p>
June 2002	Presented two Brownfields Training short courses at Big Horn College at Crow Agency, Eastern Montana, Introduction to Hydrogeology and Baseline Monitoring Design.
Dec. 2001	Hired by Phil Patton to construct a groundwater-flow model using MODFLOW to evaluate pit infilling of the Meridian Gold Bear Track Mine - south pit, near Cobalt, Idaho.
Dec. 2001	Hired by Kelly Schmitt of the Montana Department of Environmental Quality to oversee the technical work (groundwater modeling and particle tracking) associated with constructing a controlled groundwater area around the Bitterroot Valley Sanitary Landfill State Superfund site.
Oct. 2001	Completed full on-line WEB course entitled "Mining and the Environment", designed primarily for a Native American audience.
Sep. 2001	Performed two step-drawdown tests for O'Keefe Drilling and Kerin & Associates of Bozeman, MT for two production wells at the Big Hole Ranch near Maiden Rock. These were in preparation for constant-discharge tests to be subsequently performed.
Jul-Aug 2001	Taught short course at the Universidad Nacional de Alti-Plano at Puno Peru in Spanish on "Introduction to Hydrogeology and Groundwater-Flow Modeling", 53 participants.
June 2001	Taught short course at Rocky Boy Indian Reservation on "Groundwater on Tribal Lands" Instruction followed by a field trip.
May 2001	Hired by Kevin Johnson of Seattle Washington to evaluate water development potential near Ennis, Montana.
Apr. 2001	Work with Dave Baldwin of Water Right Solutions Inc. of Helena Montana on Numerical Modeling and software training using GMS to simulate groundwater flow conditions near a proposed Cobalt mine near Salmon, Idaho.
Jan. 2001	Went with professors from Montana Tech in a State funded project to evaluate impacts from mining in Lake Titicaca. We have a cooperative agreement with the National University of Altiplano to conduct this research. We spent a week performing field work, including collecting fish samples for analysis of Mercury content.
Nov. 2000	Hired by Phil Taylor of Dillon Montana to conduct a field test to evaluate pond seepage and irrigation well design for a proposed 9-hole golf course. Prepared the technical aspects for two water-use permits. Served as expert witness and attorney (provided questions) for client at public hearing in Nov. 2001. Successful permit.
Nov. 2000	Performed technical assistance for Joan Mitchell on source-water and contamination issues at the Rocky Boy Indian reservation. Included a site visit of existing environmental problems.
May - Oct. 2000	Provided technical assistance, conceptual model design, software training, and report review for Water and Environmental Technologies of Butte, Montana for the Jim Bridger power plant near Point of Rocks, Wyoming.
Sept. 2000	Presented four short courses at the Joint Engineers Conference for ASCE, Montana Society of Engineers, Society of mining and Exploration, and consulting Engineers Council of Montana. Intro. to hydrogeology, Interpretation of groundwater level data, groundwater pumping tests, and Groundwater slug testing.
May and August 2000	Hired by Butte School district No.1 to perform paper work for water use permit and design of irrigation well for East Junior High School. Supervised drilling, screen selection, well completion, and well

development.

May-June 2000 Accompanied a delegation of technical and legal advisors to the Kyrgyz Republic to review water policies and water laws. Provided input as a hydrogeologist in preparation and presentation of technical meetings which lasted two days with representatives at all levels of government.

May 2000 – Nov. 2001 Hired by Clayton Hildreth developer from Dillon, Montana to perform the source-water protection delineation study, model, and design the public water supply system for the Clark Major Lookout subdivision, service to 55-60 lots. Performed constant-discharge pumping test and analysis on production well in Sep. 2001. Successful permit.

Dec. 1999 Performed a technical evaluation for the Montana DEQ on groundwater and transport modeling performed by Maxim Engineering on the Bitterroot Sanitary Landfill State Superfund site as a controlled groundwater area near Victor Montana. A report detailing the strengths and weaknesses was produced and used resulting in a settlement. Water users were given guidance as to resource use.

May 1993 - May 2001 Short course Instructor of over 30 short courses. Many of these were prepared as training for Montana DEQ Personnel. Topics include: Introduction to hydrogeology, Introduction to MODFLOW, Groundwater Modeling with GMS, Contaminant Transport Using MT3D and RT3D, Field Hydrogeology, Basic Statistics of Environmental Data, Baseline Monitoring Design, Groundwater Monitoring Design, and Virus Transport. Other Short courses include those listed below. Also, In Sept. 1997 I was invited to teach a 2-hour short course on Slug test Analysis at the Rocky Mountain Groundwater Conference in Boise, Idaho and taught a short course in August 1999 at the Fort Belknap Indian Reservation on Mining and the Environment.

Oct. 1998 McLeod Realty wanted an evaluation performed and a proposal for fieldwork associated with the Stoneridge Property behind Hillcrest School in Butte, Montana, Included were proposed monitoring wells, surface control, and reason for springs of the property.

July 1998 Was hired by Les and Francis Castren and neighbors of Butte, Montana to evaluate the effects of construction of a paved pathway along Blacktail Creek and excavation of ponds and why they were experiencing basement flooding. Aquifer testing and a field report was provided.

May 1998 Harmon Prine of Lima, MT wanted me to evaluate water-development potential for Clark Canyon Estates. Two dry holes were drilled prior to being contacted. A geologic investigation was conducted, with recommendations.

April 1998 Was hired by Holly and Mark Hansen to evaluate the impact of a proposed 89-unit RV park on their Drive-in business well, including the impacts from septic tanks and groundwater discharge. This resulted in the project being denied.

Aug. 1996 -Jun. 1997. Was hired by School District Number 1 in Butte, MT to investigate the nature of water problems at the Hillcrest Elementary School. Beginning June and July, 1996, a field investigation was conducted to determine why groundwater was seeping into the basement. O'Keefe Drilling was sub-contracted to perform well drilling of the monitoring wells. I designed the monitoring wells and worked as the driller helper during the well completion. A report containing the explanation of problems and recommendations for the dewatering design was provided June - August, 1996. A dewatering system was designed and implemented with automatic controls and an alarm system for pump failure. System testing began in March, 1997. System was optimized during an extremely wet year (180% of normal) March - June, 1997.

June, 1997 Hired by Doug Beck of Beck Drilling in Deer Lodge, MT to perform a grain-size analysis and recommend the slot size and production zone of

a 500 gpm irrigation well.

May, 1997 Was hired by Phil Patton of Gem River Corp. To perform slug-testing and estimate pre and post mining hydraulic conductivity values of the shallow aquifer they are mining for sapphires and gold. Location near Galen, MT.

May, 1997 Dwight Wallenius and neighbor both requested a field investigation to recommend water-well locations on their properties of 71 acres and 20 acres respectively near Phosphate, MT. Successful permit.

Sept., 1996. Barbara and Bob Stem of Deer Lodge, MT hired me to perform a field evaluation for water well locations on their 600 plus acre property near Drummond, MT. after they had already had a poor first attempt. Successful remedy and a permitted well resulted.

August, 1996. Performed a groundwater flow model with Anthony J. Paulson of the Silver Crescent Mill Site, Idaho. This was funded under U.S.D.A. Forest Service, contract No. 43-0343-6-0059.

July, 1996. Fisher Industries hired me to provide modifications to a final impoundment design for the Charles Page Pit of Bozeman, MT. Specifications for a slurry wall were provided after a site investigation was performed. DNRC and DEQ personnel and from the State of Montana were present at the site investigation and concurred with the design specifications,

Nov., 1995. Was hired by P.T. Freeport Indonesia Mining Company to teach a two-week short course (six days a week, 7-8 hours per day) on Geohydrology in Tembagapura, Irian Jaya. Nov.8 - Nov 27, 1995.

August, 1995. Bill Hazlett of Butte, MT hired me to direct the drilling and well construction of his domestic well. Drilling was by the cable-tool method. Specs. and screen size successfully completed.

1994, 1995, and 1996. Developed, marketed, and taught a short course in groundwater modeling Entitled How to Use MODFLOW. I was assisted by John Metesh of the Bureau of Mines and Geology in May or June.

May, 1995. Hank Kerttula of Avon, MT asked me to perform a geological investigation of his property to evaluate the potential for a high capacity (500-gpm) irrigation well. It was determined the aquifer was inadequate to yield this quantity.

April, 1995. Paul Chirico of North Anaconda hired me to evaluate and design a 500-gpm irrigation well. A pilot hole was drilled and an evaluation was performed based upon the drilling information. Water-use permit paperwork was also performed and successfully granted.

October, 1994. Rick Stevens, Manager of the Bert Mooney Airport (Butte, MT) hired me to design two 75-gpm irrigation wells for the grounds at the airport. Was successful at obtaining a water-use permit.

Sept. 1994. Reviewed the geology textbook Modern Physical Geology by Graham Thompson and Jonathon Turk, 592 pgs., for Jennifer Bortel of Saunders College Publishing of Harcourt Brace College Publishers.

May-Aug, 1994. Was hired by the State of Montana, Department of Health and Environmental Sciences (DHES) along with John Metesh and Ted Duaine of the Bureau of Mines and Geology (MBMG) to perform oversight work of a groundwater modeling and contaminant transport project performed by PRC environmental of Helena, MT. The project (Bozeman Solvent Site) involved determining whether a moratorium on lawn sprinkling should occur for domestic homes located within a PCE plume in Bozeman, MT.

May, 1994 - 1997 Helped provide expertise and council to Steve Pomeroy of Canyon Creek, MT who was taken advantage of (deceptive practices) by a driller. Written documents, exhibits, and field tests prepared and used in court. Court preparation as an expert witness began in July 1995. The jury trial occurred in March, 1997. Direct and cross-examination, calculations,

	analysis and rebuttal testimony resulted in a conviction of deceptive practices and negligent misrepresentation.
May and June 1993	Presented two short courses sponsored by the EPA/DOE Mine Waste Pilot Program Training & Educational Activities on <u>Groundwater Development, Protection, & Contamination</u> .
March - April, 1993.	Washington Contractors Group, Inc. of Missoula Montana hired me to address public concern about a water well completed in the Pipestone, Montana residential area to be used for their railroad ballast quarrying operation. Addressed a hostile public meeting, performed a pumping test and fracture-flow groundwater model to address all the technical questions raised by the Dept. of State Lands.
1992, 1993	Montana State Superfund, to evaluate preliminary modeling of future Berkeley Pit water-level elevations and inflow rates, Feb. 1993. Was hired by the same agency to perform statistical correlation studies associated with water-level data near the Berkeley Pit in Butte, Montana in 1992.
April, 1993.	Assisted Virgil Gochanour of Anaconda, MT obtain the second water use-permit in Montana (since changes occurred in the law in 1991) to irrigate 16 acres of cropland and water livestock (125 gpm well). Worked with state agencies involved and designed the water-well completion and performed a pumping test. Successful application.
August 1992.	Performed well-siting work and spring development design for Lazy J K Ranch in Drummond, MT, This and other <u>numerous</u> domestic jobs have resulted from recommendations by Brazille Drilling and O'keefe Drilling of Butte Montana.
May-June, 1992.	Performed a hydrogeological study of the impact of a 125-gpm irrigation well for a cemetery on surrounding wells for John Evans, owner of the Mountain View Cemetery in January 1992. Assisted John in obtaining the first water-use permit in Montana (since law changes in 1991). Performed logging of well cuttings, directed and designed well completion, performed pumping test and analysis.
January 1991.	Technical writing. Was hired by Jane Baker, Assistant Director at Butte Vocational Technical Center to develop curriculum for certificate and associate degrees in applied science in environmental sampling and hazardous materials handling.
March 1990.	Performed geostatistical modeling of 1985-87 Ozone data by state in the United States, Work performed with Dr. Pete Knudsen in association with A.S.L. and Associates, Helena, MT. Awarded by Battelle Northwest.
May 1989.	Performed a field investigation and written recommendations in, for JoAnn Spolar on a ranch near Wise River, MT, to determine the feasibility of spring development for a domestic water supply.
December 1986.	Developed a mining game for St. Joe American Co. of Tucson, AZ, A 2000-line FORTRAN computer program which assists managers with decisions related to micron-gold deposits.
1983 - 1985.	Contract drilling for Black Butte Coal Co., Rock Springs, WY. Logging drill holes and geophysical logging, have personally logged approximately 100,000 feet of core, drill cuttings, and installed monitoring wells since 1981.

UNDERGRADUATE RESEARCH

Heather Schledewitz	2003	Static Water Level Conditions in the Sand Creek Drainage Basin. Heather presented her research at U of Utah in April 2003 at the National URP conference.
Karl Williams	2005	Evaluation of an Artificial Aquifer near Blacktail Creek, Butte, MT
Talia Flagan	2005	Evaluation of Seasonal Influences on the Hydrogeology of the Sand Creek Basin
Karl Williams	2006	Geiger Counter Survey for Potential Uranium Anomalies in

		Jefferson County, Montana
Sara Morrison	2007	Influences of Industrial Contributions to Water Levels in the Sand Creek Basin
Lauren Gorden	2009	Radionuclides in groundwater in Upper Jefferson County, Montana
Ndeh Tambe	2009	Evaluation of the Influences of Normal Recharge to Water Levels in the Sand Creek basin
Brandon Saiki	2013	Migraine Headaches: Are they an Issue at Carroll College? Senior Thesis.
EAS304Methods Class	2015	Field Reconnaissance Investigation to Explain Elevated Arsenic and Nitrates in the Raven Road Area, Helena Montana
EAS304Methods Class	2017	Coal Dust Mobilization and Deposition from Coal Trains Near Helena, MT
Mathew McHugh	2018	A Numerical Model of the Subaerial Landslide Generated Waves of the Berkeley Pit, Senior Thesis.
EAS304Methods Class	2019	Solving the Water Mystery: Unionville Reconnaissance Groundwater Analysis
Delaney Wilson & Maxwell McGee	2019	Spring Meadow Lake Risk to Public Health
Anna Christman	2019	Cave Dwelling Dust Bunnies: Lint Accumulation and Microplastics in Lewis and Clark Caverns State Park

ADDITIONAL TRAINING/CERTIFICATION

Carroll College Engineers Without Borders (EWB) faculty advisor for Guatemala Project. Since 2009 with trips in 2010, 2012, 2013, 2015, and 2017, also assisted with the Carroll Mexico Project in June 2013 and 2017.

Registered Professional Engineer No. 10545 P.E. in State of Montana (By exam, Oct. 1992)

Registered Professional Engineer No. 8176 P.E. in the State of Idaho (Feb, 1996 to 2011, currently inactive).

Alfred P. Sloan foundation certificate of Appreciation for my commitment to advancing the education of minority students in mathematics, science, and engineering.

Engineer in Training (Passed FE exam, April, 1991).

C.P.R. certified and passed Red Cross First Aid Course (refresher good through 2017).

40 hour Health and Safety Training Certification for hazardous waste activities (annually 8-hr refresher, current to Sept 2015).

Monitoring Well Constructor's License for the State of Montana (MWC-215), from 1990 - 2010
Eagle Scout

PUBLICATIONS

Weight, W.D. (2020) Rolling Acres Subdivision Analysis. Prepared for the Fairview Neighborhood Association. August 2020 6 p. with 25 figures, and an addendum.

Weight, W.D. (2020) Documentation_12_2019_SLM model. A documentation report of an 8-layer numerical groundwater model for the Kalispell Valley. Prepared for Water for Flatheads Future (WFF), January 2020, 20 p.

Weight, W.D. (2019) Practical Hydrogeology: Principles and Field Applications 3rd Ed; McGraw-Hill Education. New York, N.Y. ISBN No. 978-1-260-11689-1. 777 p.

Weight, W.D. (2018) Historical Document of the DeBuff Application. Technical report prepared for Bloomquist Law Firm. Helena MT. 28 pages.

Weight, W.D. (2018) Tysse/Cob Field Report 4_20_2018. Technical report prepared for Lund Law of Bozeman, MT, 9 pages.

Weight, W.D. (2017) DeBuff Water-Budget Document; updated conceptual model and depletion analysis associated with the water-use permit of Dan and Sandra DeBuff of Shamut MT. 9 pages.

Weight, W.D. (2017) Summary Document of Depletion Concerns; in behalf of Walter Schweitzer and Cindy Palmer as part of the application process for a beneficial water-use permit. 11 pages.

Weight, W.D. (2017) Pre-Filed Expert Testimony Weight for Objectors; regarding the Montana Artesian Water Company Application for proposed Water Bottling Plant in Kalispell Montana. July 2017. 37 pages.

Weight, W.D. (2017) Conceptual Model DeBuff 2017; regarding depletion and other concerns associated with the water-use permit of Dan and Sandra DeBuff. 8 pages.

Weight, W.D. (2016) Water-Use Application and Aquifer Test Report for the Schweitzer Ranch near Geyser, MT. 12 pages

Weight, W.D. (2016) Expert Response to Deficiency Letter From DNRC Regarding Water Use Application: 40A 30105384 for 1500 gpm Pivot System near Living Springs, MT. 12 pages

Weight, W.D. (2016) Expert Testimony Regarding Indian Springs Application 76D 30071039 near Eureka, MT. Report and analysis of DRNC numerical model, field work and written testimony supporting the water-use application for multiple domestic (350 RV units) and commercial use. 27 pages.

Lund, H.L., **Weight, W.D.**, and Lopach D.R. (2015) Fracking in Montana: Asking Questions, Finding Answers. Edited by Brennan B. Funded by a grant managed by the Montana Farmers Union. 57 pgs. <http://lund-law.com/news-publications/> Released Dec. 2015.

Wood, T. and **Weight, W.D.** (2015) North Plains Groundwater Conservation District Stratigraphic Visualization Model, Final report prepared for the North Plains Groundwater Conservation District, Dumas TX, commissioned by Aquaveo Water Modeling Solutions, Provo UT. 136 p.

Weight, W.D. (2013) Groundwater development potential of the DeBuff Property, Shawmut, MT, 4 pages.

Weight, W.D. (2012) Numerical Modeling of Groundwater-flow and Heat Distribution Associated with the Geothermal Heat Pump System for the Kalispell Regional Medical Center. Technical report prepared for Northwest Healthcare Kalispell Regional Medical and Billmeyer & Hafferman Inc. 16 pages with 4 appendices.

Weight, W.D. (2012) Building a Better Tomorrow: Carroll EWB in Guatemala. Carroll Magazine Fall 2012, pp 18-19. <http://www.carroll.edu/alumni/resources/magazine/>

McNabb, J. and **Weight W.D.** (2011) LaDuke Hot Springs Pre-Design Investigation, Prepared for the Church Universal and Triumphant near Gardiner, MT. 8 pages with 4 appendices.

Weight, W.D. (2011) The Crow Water Compact Crisis. Informational PDF file presented to those interested in knowing the water issues associated with the Crow Water Settlement Act of 2010 prepared for members of the Crow Tribe, where Congress and President Obama signed a compact without full representation from all Crow parties.

Weight, W.D. and Chandler, K. M. (2010). Hydraulic Properties of Rocky Mountain First-Order Alluvial Systems and Diurnal Water-Level Fluctuations in Riparian Vegetation. Journal of Environmental Science and Engineering, David Publishing Company, Chicago IL, Vol. 4, No 9, pp 12- 23.

Kill Eagle, J.L., Gammons, C., **Weight, W.D.**, Babcock J., Jepson W., Langner H (2009) Results and Lessons Learned from a Continuous Injection Tracer Test in a Small Mountain Stream Receiving Acid Mine Drainage. Springer-Verlag, Mine Water Environ Vol. 28, pp 183 – 193.

Weight, W.D. (2008) Hydrogeology Field Manual 2nd Ed., McGraw-Hill Publishing, Professional Book group, New York, N.Y. ISBN No. 978-0-07-147749-9, 751 pages

Weight, W.D., and Snyder, D.M. (2007) Beaverhead Valley groundwater study – Final report, contract USBR 526091 for US bureau of Rec. Billings, MT office.

Halford, K.J., **Weight, W.D.** and Schreiber, R.P. (2006) Interpretation of Transmissivity Estimates from Single-Well Pumping Tests. Ground Water Vol. 44, No. 3, pp 467- 471.

Weight, W.D. (2006) Field Performance and Errors in the Analysis of Slug tests. Conference Proceedings of the 2006 North American Environmental Field Conference and Exposition. Tampa, Florida. Presented by the Nielson Environmental Field School, 15 pages.

Gammons C.H., Slotton D.G., Gerbrandt B., **Weight W.**, Young C. A., McNearny R. L., Cámac E., Calderon R. and Tapia H. (2006) Mercury concentrations in fish, water, and stream sediment in the Rio Ramis-Lake Titicaca watershed, Peru. Science of the Total Environment, 368 (2-3), 637-648. Online at www.sciencedirect.com

Weight, W.D. (2005) Level Measurements in Groundwater Monitoring Wells; Chapter 26 in: Environmental Instrumentation and Analysis Handbook; R. Down and J Lehr, eds; John Wiley and Sons, New Jersey, pp 567-592.

Weight, W.D. and Johansen, E.A. (2004) Quantifying the Variables Causing Debris flows in Drainages Ravaged by Fires; in proceedings of the 39th Symposium on Engineering Geology and Geotechnical Engineering, Butte, Montana

Weight, W.D. and Metesh, J. (2003) How to Use MODFLOW. A manual of the short course taught at Montana Tech of the University of Montana to DEQ and other parties. 81 p.

Weight, W.D. (2003) Letter Regarding Review of "Manual of Applied Field Hydrogeology", Readers' Forum, Ground Water, Vol. 41, No.6, p. 723

Gamache, M., Schreiber R.P., and **Weight, W.D.** (2003). Estimating Induced Infiltration and Cross-River Flow From Numerical Modeling, Proceedings MODFLOW and MORE 2003 Understanding through Modeling Vol. 1, International Ground Water Modeling Center, Colorado School of Mines, Golden Colorado, Sep 16 –19, 2003, pp.159 – 163.

Weight, W.D., Schreiber R.P. and Gamache, M, (2003). Numerical Evaluation of the Effective Thickness in Pumping Tests, Proceedings MODFLOW and MORE 2003 Understanding through Modeling Vol. 2, International Ground Water Modeling Center, Colorado School of Mines, Golden Colorado, Sep 16 –19, 2003, pp.702 – 706.

Gammons, C., B. Gerbrandt, **W. Weight**, R. McNearny, C. Young, D. Slotten, A. Huamani, A. Camac, R. Calderon, and H. Tapia. (2003), "Preliminary Assessment of Mercury Contamination Due to Gold Mining in the Rio Ramis-Lake Titicaca Watershed, Peru," Proceedings EPD CONGRESS '2003, San Diego, CA, March 2-6, Ed. M. Schlesinger, TMS, Warrendale, PA.

Weight, W.D. (2002) "Cosmology, it all started with a bang." Science Mine article in the Montana Standard, Butte Montana, printed Nov. 9, 2002.

Weight, W.D. (2002) "Oh the weather outside is frightful, but where is the ice?." Science Mine article in the Montana Standard, Butte Montana, printed Feb. 9, 2002.

Weight, W.D. and Sonderegger, J.L., (2001). *Manual of Applied Field Hydrogeology*, McGraw-Hill Publishing Company, Professional Book group, New York, N.Y. ISBN No. 0-07-069639-X, 608 pages.

Schaar, M. and **Weight, W.D.** (2000) Numerical Groundwater Flow and Contaminant Transport Model with Remediation Strategies for the Bozeman Sanitary Landfill, Gallatin County, Montana. Technical report prepared for Permitting and Compliance of Solid Waste group of the Montana Dept. of Environmental Quality, Helena Montana.

Weight, W.D. and Wittman G.P. (1999) Oscillatory Slug-Test Data Sets: A comparison of Two Methods, *Ground Water*, Vol. 37, No. 6 Pages 827-835.

Weight, W.D., (1998), The Distribution of Angle of Repose Data. *Journal of Geoscience Education*, v. 46 p. 51-54.

Weight, W.D. and Paulson, A.J., (1996), hydrological Modeling of the Silver Crescent Mill Site, Idaho. Report to the U.S.D.A. Forest Service regional engineering office in Missoula, MT under contract number 43

Erickson, E. and **Weight, W.D.**, (1995), Water-Resource Evaluation and Groundwater-Flow Model for Sypes Canyon, Gallatin County, Montana. Final report to Dept. of Health and Envir. Sciences. Contract # 240129, 28 pgs.

Weight, W.D., and Metesh, J., (1995), How to Use MODFLOW, a short course taught at Montana Tech of the University of Montana, Butte, MT, 55 p. revised in 2003.

Custer, S.G., Michels, D.E., Sill, W., Sonderegger, J.L., **Weight, W.D.**, and Woessner, W.W., (1994), Two Strategies for Yellowstone National Park Hydrothermal Protection in Light of Scientific Uncertainty; in, Marsdon R.A. and Hasfurther, V.A., editors; in, *Effect of Human Induced Changes on Hydrologic Systems*, American Water Resources Association, Jackson Hole, WY. June, 1994, pgs 821-830.

Weight, W.D., and Carriou, T.M. (1993), Short Course notes on Groundwater Development, Protection & Contamination, for U.S. E.P.A., D.O.E, and Mine Waste Pilot Program at Montana Tech, Butte, MT., 159 p.

Weight, W.D., Borgman, L.E. and Quimby, W.F., (1989), "GEOSAM, a Knowledge-Based Computer System for Planning Geological Sampling Procedures," *the Compass*, Sigma Gamma Epsilon, Vol. 66 #4.

Utaminarsih, W.S., and **Weight, W.D.** (1989), "Geophysical Surveys and Hydrogeological Impacts of the Colorado Tailings Superfund Site Near Butte, MT - U.S.A.," 14th Annual Meeting of the Indonesian Association of Geophysicists, Jakarta, Conference, Proceedings.

Weight, W.D. (1989) "Knowledge-Based Computer Systems for Two Topics in Geology: Micron Gold Deposits and Planning Geological Sampling Procedures," Ph.D. Dissertation, University of Wyoming.

Borgman, L.E., Easley, D.H. and **Weight, W.D.** (1987) "Characterization of the Hoe Creek UCG Site and Geostatistical Modeling," Environmental Monitoring Systems Laboratory, Las Vegas, NV, U.S. Environmental Protection Agency, Project No. CR-811244-01-0.

Borgman, L. E. and **Weight, W.D.** (1987) "Geophysical Logs and Well Completion Diagrams from the Hoe Creek UCG Site, Campbell County, Wyoming," Geology Department Research Report 87:1, University of Wyoming, Laramie, WY.

Borgman, L.E., **Weight, W.D.** and Barteaux, W. (1986) "The Information Retrieval System for the

Hoe Creek data Base," a report to EPA-EMSL Las Vegas, 55 pp.

Goldstein, F. J., and **Weight, W.D.** (1982) "Subsurface Information from Eight Wells Drilled at the Idaho National Engineering Laboratory, Southeastern Idaho," U.S. Geological Survey Open File Report 82-644, 29 pp.

ABSTRACTS

Weight, W.D. Numerical Groundwater Flow Model of the Flathead Valley, Kalispell Montana. Presented at the American Water Resources Association, Montana Section Meeting at Fairmont Red Lodge MT, Oct 2019.

Weight WD, Numerical Groundwater Flow Model of the Middle and Lower Flathead Valley, Kalispell Montana. American Water Resources Association, Montana Section Meeting, Helena MT, Oct 2017.

Weight WD, The Mystery of the Butte Sinkhole. American Water Resources Association, Montana Section Meeting, Fairmont Hot Springs MT, Oct 14, 2016

Weight WD, Lund H.L., and D. Lopach, Fracking: What are the Questions About Water? , American Water Resources Association, Montana Section Meeting, Kalispell MT, Oct 9, 2015.

Weight WD. and Hafferman, K. Resolving Conflicts Associated with a New Geothermal Heat Pump System for the Kalispell Regional Medical Center Through Numerical Modeling and Drilling. , American Water Resources Association, Montana Section Meeting, Kalispell MT, Oct 9, 2014

Bryce, G. and **Weight WD**, An evaluation of Artificial Groundwater Recharge as a Conjunctive use Approach to Mitigating Surface Water Depletions, American Water Resources Association, Montana Section Meeting Oct. 7, 2011

Weight WD, Chandler, K, and Marlow C. Evaluating the hydraulic properties of shallow first-order alluvial systems and the aquifer diurnal water-level fluctuations at different vegetation sites in Hay Creek, Whitetail Basin, Southwestern Montana. Programs in the North American Environmental Field Conference and Exposition, sponsored by the Nielson Environmental Field School, Inc in Tampa, Fl. Jan.13, 2010

Chandler, K, **Weight WD**, and Marlow C, A comparison of Shallow Aquifer Diurnal Water-Level Fluctuations at Different Vegetation Sites in Hay Creek, Whitetail Basin, Montana. AWRA and Montana Center for Riverine Science, Missoula, MT, Oct. 1, 2009

Weight, WD, and Chandler, K, Evaluating the Hydraulic Properties of Shallow First-Order Alluvial Systems: An Analysis in Hay Creek, Whitetail Basin, Montana. AWRA and Montana Center for Riverine Science, Missoula, MT, Oct. 1, 2009

Weight, W.D., Brunson, M., Chandler K M, and Marlow, C. (2009). Groundwater Surface-water Interaction of First Oder Riparian Drainages Impacted by Conifer Encroachment.. USDA-CSREES National Water Conference, St. Louis MO, Feb 10, 2009

Weight, W.D., Chandler K M, and Marlow, C. (2008) Hydrogeology of First Order Riparian Drainages, American Water Resources Association, Montana Section Meeting Oct. 3, 2008, Big Sky Montana.

Chandler K M, **Weight, W.D.** , and Marlow, C. (2008) Shallow Aquifer Response to Phreatophyte Water Use: a Comparison of Different Vegetation Types. American Water Resources Association,

Montana Section Meeting Oct. 3, 2008, Big Sky Montana.

Link, C., Nelson, P., and **Weight, W.D.** (2008) Time-Lapse Seismic Refraction For Monitoring Zones of Water-Table Fluctuation. American Water Resources Association, Montana Section Meeting Oct. 3, 2008, Big Sky Montana.

Weight, W.D., Schreiber R.P, and Halford, K.J.,(2008) Evaluation of the Effective Saturated Thickness in Pumping Tests, Programs in the North American Environmental Field Conference and Exposition, sponsored by the Nielson Environmental Field School, Inc in Tampa, FL.

Weight, W.D. and Snyder, D. (2006) Basin analysis of groundwater changes in the northern Dillon area. American Water Resources Association, Montana Section Meeting Oct. 13 2006, Polson Montana.

Snyder, D., **Weight, W.D.** and Uthman, B. (2005) Effect of drought in the Beaverhead Valley north of Dillon, MT. American Water Resources Association, Montana Section Meeting Oct. 28 2005, Bozeman Montana.

Sudbrink, A., Madison, J., **Weight, W. D.**, and Gammons, C.H. (2005) Field investigation of contaminated groundwater near the Comet Mine reclamation site, Basin, MT. American Water Resources Association, Montana Section Meeting Oct. 28 2005 , Bozeman Montana.

Snyder, D. and **Weight, W.D.** (2005) Analysis of ground water Flow and connections with the Beaverhead River after Drought and Impacts from New Production Wells. Floodplains and Rivers: Connections and Re-connections. The University of Montana Center for Riverine Science and Stream Re-naturalization. Sept 22 – 23 2005, Missoula, Montana

Weight, W.D., and Gammons, C. (2005) A 20-Year Perspective of Montana Tech's Hydrogeology Field Camp. 67th Annual ASEE Pacific Northwest Section Meeting, Butte Montana

Weight, W.D. (2004) Integrating site characterization data into a numerical system: a case study from northern Montana. Programs in the North American Environmental Field Conference and Exposition, sponsored by the Nielson Environmental Field School, Inc in Tampa, FL.

Weight, W.D. (2004) Field performance and errors in the analysis of slug tests. A short course at the North American Environmental Field Conference and Exposition, sponsored by the Nielson Environmental Field School, Inc in Tampa, FL.

Weight, W.D. and Schledewitz, H. (2003) Water-level changes from drought and industrial impacts in the Sand Creek Drainage Basin, southwestern Montana. Annual Meeting of the Montana Section of AWRA, Reclaiming the Clark Fork.

Weight, W.D and Erickson, D. (2003) Hydrostratigraphic interpretation of groundwater conditions in the north Havre Montana residential area. Annual Meeting of the Montana Section of AWRA, Reclaiming the Clark Fork.

Gamache, M., Schreiber R.P., and **Weight, W.D.**, (2003) The Potential for Induced Infiltration and Cross-River Flow Evaluated From Numerical Modeling. Assessing and Re-naturalizing Streams Impacted by Mining. The University of Montana Center for Riverine Science and Stream Re-naturalization. Sept 25 – 26 2003, Missoula, Montana

Weight, W.D., and Sonderegger, J.L. (2002) Estimating the Effective Saturated Thickness in Unconfined Aquifers From Pumping Tests. National Ground Water Association Expo., Las Vegas, NV Abstract Book of the AGWSE 2002 Annual Meeting and Conference: "Linking Surface and Subsurface Hydrology – From Science to Technology", pp 23-24.

Schaar, M. and **Weight, W.** (2000) Numerical Groundwater Flow and Contaminant Transport

Model of the Bozeman Sanitary Landfill, Gallatin County, Montana. Abstract # 70009 in Abstracts with Programs Vol. 32, Number 4, Missoula Montana.

Weight, W.D., Brayton, M.D. and Reiten, J. (1999) Recovery Response from Conservation Methods in Wells from the Basal Eagle Sandstone, Petroleum County, Montana. Abstract # 01622 in Abstracts with Programs Vol. 31, Number 4, page A60.

Weight, W.D., (1996), Slug Tests with Inertial Oscillatory Effects, Examples from the Beaverhead Groundwater Project, Montana. Abstracts of the American Water Resources Association and Montana University System Water Center Annual Meeting, 1996.

Scott, K.C., Butler, R., Boysen, J., and **Weight, W.D.**, (1995), An Investigation into the Factors and Effectiveness of Electro-Remediation of Mining Tailings at Miles Crossing, Montana, Abstract No. 33737, in Geological Society of America Abstracts with Programs Rock Mountain Sectional Meeting, Vol 27, Number 4 Bozeman, MT.

Erickson, E.J., and **Weight, W.D.**, (1995), Groundwater Resource Evaluation and Numerical Flow Model of Sypes Canyon, Gallatin County, Montana. Abstract No. 33735, in Geological Society of America Abstracts with Programs Rock Mountain Sectional Meeting, Vol 27, Number 4 Bozeman, MT.

Weight, W. D., (1992), "Addressing Uncertainty When Defining Objectives in a Geological Engineering Capstone Design Course," Abstracts in the Proceedings of the 54th annual meeting of the Pacific North West American Society of Engineering Education.

Johansen, E.A., and **Weight, W.D.**, (1991), "Quantitative Analysis of the Variables Causing Debris Flows," Abstract No. 32134 in Geological Society of America Abstracts with Programs, National Annual Meeting Vol. 23, No. 5.

Weight, W.D., and Johansen, E.A., (1991), "Statistical Analysis of Variables Causing Debris Flows in the Gibbon River Drainage, Yellowstone Park, Northwestern Wyoming," Abstract No. 15321 in Geological Society of America Abstracts with Programs, Vol. 23, No.4.

PHOTOGRAPHS PUBLISHED

Practical Hydrogeology: Principles and Field Applications 3rd Ed; McGraw-Hill Education. New York, N.Y. Book Cover and hundreds of others in the document.

The Prospector - Carroll College Student Newspaper. *EWB continues to Serve Guatemala*. An Article written by Jared Smith based upon an interview with me and two photos supplied. Vol. 6 Edition 5, page 8, Feb 6, 2014.

<http://www.carroll.edu/files/files/students/prospector/feb2014.pdf>

The Montana Catholic, Feature photo in article - *Mission visits engender good works, cultural immersion*, Volume 28, No. 6, June 15, 2012. <http://www.diocesehelena.org/news-events/mt-catholic/archives/2012/jun/guatemala-engineers-without-borders.html>

2012 Montana Water Calendar, October 2012 photo "Reflections of the Big Sky", published by the Montana Water Center <http://watercenter.montana.edu/> located on the Montana State University campus Bozeman Montana.

2006 Montana Water Calendar, Feature photo on Montana Weather, Photo "Mountain Recharge", published by the Montana Water Center <http://watercenter.montana.edu/> located on the Montana State University campus Bozeman Montana.

TECHNICAL PRESENTATIONS

Weight, W.D. Numerical Groundwater Flow Model of the Flathead Valley, Kalispell Montana.

SCANNED

Presented at the American Water Resources Association, Montana Section Meeting at Fairmont Red Lodge MT, Oct 11, 2019.

Weight, W.D. Controversial Outcomes of Activities Associated with Municipalities & Utilities. Invited 90-minute presentation at the Montana 2018 Joint Engineers Conference, Helena MT Nov. 7, 2018.

Weight, W.D. Making Sense of a Very Complex Hydrogeologic Model in the Kalispell Valley Northwestern Montana. Invited presenter at the 1st Annual Aquaveo User's Conference, Provo UT, Oct 16, 2018.

Weight, W.D. Numerical Groundwater Flow Model of the Middle and Lower Flathead Valley, Kalispell Montana, Montana Section Meeting at Fairmont Hot Springs MT, Oct 19, 2017.

Weight, W.D. *The Mystery of the Butte Sinkhole*. Presented at the American Water Resources Association, Montana Section Meeting at Fairmont Hot Springs MT, Oct 14, 2016.

Lund, H.L., **Weight, W.D.** and Lopach, D. *Fracking in Montana: Asking Questions. Finding Answers*. Presented by invitation at the 100th anniversary of the Montana Farmer's Union meeting in Great Falls, MT on Oct, 24th, 2015

Weight, W.D., Lund, H.L., and Lopach, D. *Fracking In Montana: What Are The Questions About Water?* Presented at the American Water Resources Association Meeting Linking Water Research to Policy and Water Management in Missoula MT on Oct 9, 2015

Resolving Conflicts Associated with a New Geothermal Heat Pump System for the Kalispell Regional Medical Center Through Numerical Modeling and Drilling. Presented at the American Water Resources Association, Montana Section Meeting, Kalispell MT, Oct 9, 2014.

Retrofit structural walls at the La Asunción School in Suchitepéquez Guatemala. An invited presentation given with Jacob Johnson at the Helena Lion's Club lunch meeting on April 15, 2014.

How to Develop Conceptual Models for Groundwater Flow and Contaminant Transport at Petroleum Hydrocarbon Sites. An invited 1-hour presentation at the 7th International Consultants Seminar on the Characterization and Remediation of Sites Impacted by Hydrocarbons, sponsored by Pemex Oil, in Mexico City Aug 26-30, 2013

Geothermal Heat Management in the Deep Kalispell Aquifer, Montana USA. Invited 1 hour presentation at the 6th International Consultants Seminar on the Characterization and Remediation of Sites Impacted by Hydrocarbons, sponsored by Pemex Oil, in Mexico City Sept.11-15, 2012.

Interview by Susan Gallagher in The Montana Catholic, *Mission visits engender good works, cultural immersion*, Volume 28, No. 6, June 15, 2012. <http://www.diocesehelena.org/news-events/mt-catholic/archives/2012/jun/guatemala-engineers-without-borders.html>

Feature Interview by Luke Epplin in Connections Magazine Vol. 6 Issue 1, Page 7, *Interview: A Conversation with Willis Weight of Carroll College*. Education USA - Sponsored by US Department of State <http://www.fulbright.jp/study/res/cn0112env.pdf>

Hands-On Learning with Examples from the Carroll College Engineering Department, Presented as an invited speaker at the Helena Montana Rotary club meeting on Jan. 25, 2012.

Invited 1 hour presentation at the 5th International Consultants Seminar on the Characterization

and Remediation of Sites Impacted by Hydrocarbons, sponsored by Pemex Oil, in Mexico City July 25-30, 2011.

Invited 1-hour presentation, followed by 1 ½ –hours of questions. The Crow Water Compact Crisis, Little Big Horn College, Crow Agency Montana on Feb 17th, 2011.

2-hour invited short-course presentation. Field Performance and Errors in the Analysis of Slug tests. Presented as an invited speaker at the North American Environmental Field Conference and Exposition, sponsored by the Nielson Environmental Field School, Inc. in San Diego, CA. on January 12, 2011.

2-hour invited short-course presentation. A look at non-ideal aquifer test responses. Presented as an invited speaker at the North American Environmental Field Conference and Exposition, sponsored by the Nielson Environmental Field School, Inc in Tampa, FL. on January 14, 2010

Evaluating the hydraulic properties of shallow first-order alluvial systems and the aquifer diurnal water-level fluctuations at different vegetation sites in Hay Creek, Whitetail Basin Southwestern Montana. Presented as an invited speaker at the North American Environmental Field Conference and Exposition, sponsored by the Nielson Environmental Field School, Inc in Tampa, FL. on January 13, 2010

Evaluating the Hydraulic Properties of Shallow First-Order Alluvial Systems: An Analysis in Hay Creek, Whitetail Basin, Montana. AWRA and Montana Center for Riverine Science, Missoula, MT, Oct. 1, 2009

Groundwater Surface-water Interaction of First Oder Riparian Drainages Impacted by Conifer Encroachment.. USDA- CSREES National Water Conference, St. Louis MO, Feb 10, 2009.

2 hour Keynote Presenter. Hydrogeology and Geology for Drillers, at the 64th Annual Montana Water-Well Driller's Association annual meeting in Helena Montana, Feb 4, 2009

Hydrogeology of First Order Riparian Drainages, American Water Resources Association, Montana Section Meeting on Oct. 3, 2008, at Big Sky Montana.

Evaluation of the Effective Saturated Thickness in Pumping Tests, Presented as an invited speaker at the North American Environmental Field Conference and Exposition, sponsored by the Nielson Environmental Field School, Inc in Tampa, FL. on January 14, 2008

Summary of two years of data collected in the Beaverhead Valley north of Dillon Montana, Beaverhead watershed committee meeting, Dillon Montana, Nov. 2, 2006.

Basin analysis of groundwater changes in the northern Dillon area. American Water Resources Association, Montana Section Meeting Oct. 13 2006, Polson Montana.

Field Performance and Errors in the Analysis of Slug tests, an invited short-course speaker at the North American Environmental Field Conference and Exposition, sponsored by the Nielson Environmental Field School, Inc in Tampa, FL. on January 11, 2006.

Explanation of EPA's RI alternatives for the Midnight Uranium Mine on the Spokane Indian Reservation. A 2-hour presentation at the tribal college on the Spokane Indian Reservation on Nov. 17, 2005.

Effects of drought and Production Wells in the Beaverhead Valley north of Dillon Montana, Beaverhead watershed committee meeting, Dillon Montana, Nov. 7, 2005.

A 20-Year Perspective of Montana Tech's Hydrogeology Field Camp. 67th Annual ASEE Pacific Northwest Section Meeting, Butte Montana April 8th, 2005.

SCANNED

2 ½ hour Keynote presentation. "The hydrogeology of irrigation well design and completing the permit process" Presented at the Irrigation Association and NRCS Engineer's meeting in Missoula Montana Feb. 23 2005.

"Development of the Madison Group Aquifer as a drinking Water Source for Crow Agency and Lodge Grass Montana", presented at Big Horn College Crow Agency, Montana on Oct. 15 2004.

"Quantifying the Variables Causing Debris flows in Drainages Ravaged by Fires", Presented at the 39th Symposium on Engineering Geology and Geotechnical Engineering, Butte, Montana, May 19, 2004.

"Field performance and errors in the analysis of slug tests." A short course presented at the North American Environmental Field Conference and Exposition, sponsored by the Nielson Environmental Field School, Inc in Tampa, Fl. on January 16, 2004.

"Integrating site characterization data into a numerical system: a case study from northern Montana." Presented as an invited speaker at the North American Environmental Field Conference and Exposition, sponsored by the Nielson Environmental Field School, Inc in Tampa, Fl. on January 14, 2004

"Water-level changes from drought and industrial impacts in the Sand Creek Drainage Basin, southwestern Montana". Annual Meeting of the Montana Section of AWRA, Reclaiming the Clark Fork. Presented Oct 2. 2003 in Butte, MT.

Hydrostratigraphic interpretation of groundwater conditions in the north Havre Montana residential area. Annual Meeting of the Montana Section of AWRA, Reclaiming the Clark Fork. Presented Oct 2. 2003 in Butte, MT.

"The Potential for Induced Infiltration and Cross-River Flow Evaluated From Numerical Modeling". Assessing and Re-naturalizing Streams Impacted by Mining. The University of Montana Center for Riverine Science and Stream Re-naturalization. On Sept 25, 2003, Missoula, Montana.

"Numerical Evaluation of the Effective Thickness in Pumping Tests". MODFLOW and MORE 2003 Understanding through Modeling, International Ground Water Modeling Center, Colorado School of Mines, Golden Colorado, on Sep. 19, 2003.

"Estimating the Effective Saturated Thickness in Unconfined Aquifers From Pumping Tests". National Ground Water Association Expo., Las Vegas, NV on Dec. 10, 2002.

"Peru, Puno, and Proyecto C - Slides, Commentary and Preliminary Results", Presented at Montana Tech of the University of Montana on March 6, 2001. Co-presenters Colleen Elliott, Butch Gerbrant, and Chris Gammons.

Presented four short courses at the Joint Engineers Conference for ASCE, Montana Society of Engineers, Society of mining and Exploration, and consulting Engineers Council of Montana. Intro. to hydrogeology, Interpretation of groundwater level data, groundwater pumping tests, and Groundwater slug testing. Helena, Montana Sept. 2000.

"Australia and Indonesia, Cultural & Environmental Conflicts form Mining", Dinner speaker for the Consultants Conference at Fairmont Hot Springs sponsored by the Montana Department of Environmental Quality March 30, 2000.

Chaired the Rock Mountain Section GSA meeting in Pocatello Idaho on Source-Water Protection, Unique Cases and lessons Learned, April 8, 1999. Presented "Recovery response from Conservation Methods in Wells from the Basal Eagle Sandstone, Petroleum County, MT.

"Hydrologic Investigation and Engineering Design of Dewatering Problems at Hillcrest School Butte, MT - A case Study". Presented at Boise, Idaho Connections '97 - Groundwater in the Rocky Mountain Region also a 2-hour short course on Slug-Test Analysis.

"Slug Tests with Inertial Oscillatory Effects; Examples from the Beaverhead Groundwater Project, Montana", AWRA and Montana Water Center Conference at Western Montana College, Dillon, MT. Oct. 3, 1996.

"Geology and Hydrogeology of the Berkeley Pit", presented at the request of the Butte chapter of C.P.A.'s at Ivanhoe's Restaurant, Butte Montana, Feb. 26, 1993.

"Addressing uncertainty when defining objectives in a geological engineering capstone course", presented at the 54th PNW ASEE meeting at Montana State University, April 25, 1992.

"The Geology of Southwestern Montana, a Global Perspective" presented by request of the Butte Kiwanis Club in December 1991, Butte, MT.

"Quantitative Analysis of the Variables Causing Debris Flows," Co-Author (presented by Eric A. Johansen), at the National Geological Society of America annual meeting, October 21, 1991, in San Diego, CA.

"The Mining Game, A Computer-Aided Stratagem for Decision Making with Micron-Gold Deposits," March 1988, Wyoming Geological Society, Casper, WY.

"GEOSAM, A Knowledge-Based Computer System for Planning Geological Sampling Procedures," October 1988, International Association of Mathematical Geologists, Tucson, AZ.

ACADEMIC HONORS

Spotlighted Professor – In the 2014 Faculty Accomplishments Publication, Carroll College.
 Marquis –Who's Who in America 2008, 2009, and 2010
 Anaconda Company Distinguished Professor of Geological Engineering July, 1991.
 Rochelle Belfer Geology Scholarship, Fall, 1988.
 W. C. Hayes Scholarship, Spring, 1988.
 The Charles S. Hill Memorial Fellowship, Fall, 1987.
 Walter Harrison Spears and Constance Chatterton Spears Fellowship, Spring, 1987.

SOCIETIES

EWB, Engineers Without Borders, Since 2009
 N.G.W.A. National Ground Water Association. Since 1988.
 Delegate of The Universities Council on Water Resources. Since 1994 - 2000
 Member of the American Water Resources Association, Montana Section (current).
 Member of the Society for Mining Metallurgy and Exploration, No. 4131160 in 2002

ACADEMIC COURSES (TAUGHT)

Cal Poly SLO

Winter qtr.

CE 435 Engineering Hydrology, 4 hrs

Carroll

Fall (day)

EAS 200 Environmental Beta 2 hrs
 Engr 325 Hydrogeology, 3 hrs
 Engr 313 Hydrology 3 hrs
 Engr 323 Water Quality for Environmental Engineers 2 hrs
 Engr 327 Land and Stream Restoration 2 hrs
 CHS 329 Public Health and the Environment 3 hrs

Spring (day)

Engr 326 Energy and the Environment 3 hrs
 Engr 324 Air Quality 2 hrs
 Engr 424 Groundwater Flow Modeling 2 hrs lec, 1hr lab
 EAS 101 Earth Science, 2 hrs lec, 2 hrs lab
 EAS 304 Environmental Field Methods, 2 hrs lec, 2 hrs lab

Montana Tech

Fall (day)

GeoE 101, Physical Geology, 2 hrs. lec, 1 hr. lab.
 GeoE 402, Groundwater Modeling, 1 hr. lec, 2 hrs. lab.
 GeoE 430, Geological Engineering Design Project, 3 hrs. lec.
 GeoE 520, Advanced Hydrogeology, 3 hrs. lec.

Spring (day)

Engr 389, Hydrogeology, 3 hrs. lec.
 GeoE 428, 528, Contaminant Transport, 1 hr. lec, 2 hrs. lab.
 GeoE 522, 523, Groundwater Monitoring, 2 hr. lec., 1 hr lab.
 GeoE 540, Applied Statistics and Experimental Design, 3 hrs. lec.
 Mining 202, Engineering Programming for Mining, 2 hrs. lec, 1 hr. lab.
 Mining 101, Introduction to Engineering Calc & Problem Solving, 2 hrs lec, 1 hr lab

Summer

GeoE 479, Hydrogeology Field Camp, 4 hrs, lab.
 GeoE 203, Introduction to Field Geology, 1 hr. lab.

SHORT COURSES (ATTENDED)

Environmental Chemistry Made Easy & Introduction to Surfactants in Remediation, Presented by George "Bud" Ivey, Ivey International Inc. Campbell River, BC Canada at the North American Environmental Field Conference and Exposition, sponsored by the Nielson Environmental Field School, Inc in San Diego CA, January 10, 2011.

Proper Drilling and Grouting Practices for a Variety of Geologic Environments, Presented by Mark Whittle and Dennis Duty of Baroid Industrial Drilling Products at the North American Environmental Field Conference and Exposition, sponsored by the Nielson Environmental Field School, Inc in Tampa, FL on January 12, 2010.

Streambank Stabilization & Erosion Control Design – Presented by Dr. David T. Williams, P.E. in Helena, MT Dec. 3-4, 2009.

The Use of Indicators for Monitoring Microbial Water Quality: A Hands on Experience Workshop. Presented at the USGS Lab in Columbus Ohio, May 6-7, 2009

Practical Karst Hydrogeology with Emphasis on Ground-Water Monitoring, presented by Dr. Ralph Ewers at the North American Environmental Field Conference and Exposition, sponsored by the Nielson Environmental Field School, Inc in Tampa, FL on January 15, 2008

Use of Arc GIS – a two-day short course presented at the University of Montana in Missoula Montana, June 23-24, 2004.

Water Resources for Native Americans - a four-day short course on water resources issues associated with Native Americans, attended and assisted in the presentation of materials. Dec. 1-4, 1998, Albuquerque, N.M.

Groundwater Flow and Transport Modeling with GMS - official four-day intensive training from the authors of GMS on groundwater and transport modeling in Park City, Utah, Oct. 27 - 30, 1997.

Environmental Chemistry for Investigating and Remediating Soil and Groundwater Contamination - three day short course taught by several presenters, through University of Wisconsin-Madison, Department of Engineering Professional Development, Tucson, Arizona Jan. 10 - 12, 1996.

Three-Dimensional Modeling of Contaminant Transport and Remedial Designs Using MODFLOW and MT3D - a four day short course taught by Dr. Chumiao Zheng and Chris Neville, through the IGWMC, Golden Colorado Jan. 30 - Feb 2, 1995.

Environmental Geosynthetics - a one day short course on geosynthetic clay liners and erosion control blankets in Missoula, MT, March 3, 1994.

Groundwater Pollution Hydrology - a weeklong short course learning over 25 different software packages related to hydrogeology, contaminant transport, and graphical output. Sponsored by the National Water Well Association in San Francisco, CA, Jan 3 - 8, 1993.

Mountain Supply Co. & Jacuzzi Pump School - a short course on sizing pumps for assorted applications in Missoula, MT, Jan. 23, 1992.

Inexpensive Software for Geologists with Examples for the IBM-PC and Other Computers - a short course with the International Association of Mathematical Geologists in Denver, CO, September 22, 1991.

MODFLOW and MODPATH - attended the short course on the U.S.G.S. groundwater flow package in Reston, VA, April 14-21, 1991.

Evaluation of College Faculty - a short course attended at Montana Tech of which I coordinated all lunches and breaks, January 18-19, 1991.

Drilling for Minerals - a short course at the Northwest Mining Association meeting in Spokane, WA, December 1-5, 1990.

Integrating Design into the Engineering Curriculum - at Southern Methodist University in Dallas, TX, March 28 - April 1990.

Lotus 123 - Advanced short course taken at the University of Wyoming, January - February, 1988.

Hydrothermal Models - a short course presented by Hans Eugster from John Hopkins University at Laramie, WY, January 14-28, 1987.

Plate Tectonics - a short course at the University of Wyoming, presented by Warren Hamilton of U.S.G.S., Denver, CO, November 1986.

Attended the 1st North American Council on Geostatistics, Dubois, WY, August 15-18, 1986, international event.

Geostatistics Workshop - at Colorado School of Mines, Golden, CO, March 6-9, 1985.

ADDITIONAL DUTIES

President of WDW Writing, Consulting & Planning INC. since 1989.

Faculty Advisor for Carroll College Engineers Without Borders (EWB) since Sept. 2009. Made three site assessment visits to the la Asunción School project in Guatemala (Fall 2009, Spring and Fall 2010) and implementation projects with retro-wall construction (shear wall construction) in May 2012, Dec 2013, Jan 2015, and Jan 2017 to help stabilize the building during a seismic event.

Budget Committee Carroll College, 2011-2012

Faculty Welfare Committee, Fall 2011 to Spring 2014

Member of Carroll Green Team – since 2009 – actively working on Carroll's irrigation supply needs.

Peer reviewer for the journal Ground Water (Sept 2005).

Appointed by the Commissioner of higher education, Sheila Sterns, to serve on the Committee on Service for the Montana Tech Campus (Fall 2005 - 2008).

Appointed the faculty representative for the New York Based Sloan foundation on Montana Tech Campus Fall 2005 through 2008. Supervised first Native American MS graduate John KillEagle.

Served as an elected board member for the Ramsay Water & Sewer district (Dec 2000) for a two-year term.

Served as Chairman of the Collegiate Evaluation Committee – evaluation of all portfolios of faculty at Montana Tech seeking promotion and tenure (2002 – 2004).

Administrative Responsibilities as Department Head, Geological Engineering. Wrote ABET volume II report for accreditation visit for Fall 1992 and follow up report in 1995. Was successful in getting accreditation through 1999. Responsible for curricular changes, budgets, and departmental scholarships. Completed my responsibilities in June, 1996.

Hydro-Geology Field camp -- director every other year. Assist with preparation each year. Directed in 1990, 1991, 1992, 1994, 1996-1998, 2000, 2002, 2004, 2007 and 2009.

Judge for Montana Tech Regional Science Fair from 1990 to 2007.

Was elected to represent the School of Mines as a member of the Chancellor's advisory committee in Oct 1999.

Advisor to undergraduate students.

Bishop for the L.D.S. Church, Butte 1st Ward in Butte, MT. (Feb. 1994 - Sept. 1999)

Stake President for the Butte, Montana Stake of the LDS Church. Responsible for 3400 members (May 2000 - Nov 2001).

SPECIAL PROGRAMS

Faculty Advisor Carroll Student Chapter of Engineers Without Borders (EWB) Guatemala Project from Fall 2009 to present. Bi-weekly meetings, fund-raising, grant writing, and travel to Guatemala with students.

Program Director for NSF Mineral Education program for Young Scholars (MEPYS). This ran from 1990 to 1993 and 1995. Activities included directing slope stability and geologic studies in Yellowstone Park, rock and mineral identification, hydrogeological field studies, and other associated field trips.

Invited by Commissioner of Higher Education John Hutchinson to participate in a symposium/workshop on the future of Broad field Science Teaching in Montana. This was in Helena in October, 1991.

Program Director for "Home-Town" Geology program. Formed three regional "home-town" geology seminars and associated field trips for 8th - 9th grade earth-science teachers in the Billings, Kalispell, and Great Falls area. Spring 1990.

Co-Chairman at the Geological Society of America (GSA) meeting in Spokane, WA, (May 1989) for the Engineering and Environmental Geology session.

Earth Science Workshop course, 2 hr. lecture, 1 hr. lab, designed for 9th grade teachers teaching earth science. 1990-92.

Hands-on Science Workshops for 4th - 6th grade teachers.

GRADUATE STUDENTS SUPERVISED

Served as chairman:

Enberg, W.S. Utami	MS 1991	Groundwater Flow Model of Saltwater Intrusion in the Jakarta Basin, West Java, Indonesia
Johansen, Eric	MS 1991	Quantitative Analysis of the Variables Causing Debris Flows
Burgher, Kathleen	MS 1992	Water-Budget Analysis of the Upper Silver Bow Creek Drainage, Butte, Montana
Carriou, Thierry M.	MS 1993	An Investigation into Recovering Water Levels in the Butte, Montana Bedrock Aquifer
Scott, Kyle C.	MS 1995	An Investigation into the Factors and Effectiveness of Electro-Remediation of Mining Tailings at Miles Crossing, Montana
Erickson, E.J.	MS 1995	Water-Resource Evaluation and Groundwater-Flow Model for Sypes Canyon, Gallatin County, Montana
Swaggert, Kathryn	MS 1996	Evaluation of Radon in Indoor Air and Groundwater Throughout Montana
Rose, James	MS 1997	Estimating Recharge to Groundwater in Eastern Montana
Wittman, Gregory P.	MS 1997	Computer Simulated Flow Model of the Groundwater Resources of the Beaverhead Valley in the Dillon Area Beaverhead County, MT
Baldwin, David	MS 1997	Hydrogeologic and Aquifer Vulnerability Investigation at

SCANNED

Brayton, Michael	MS 1998	Big Sky, MT. Recovery Response from Conservation Methods from Wells in the Basal Eagle Sandstone, Petroleum County, MT
Hills, Mark	MS 1998	Evaluation of Stable Isotopes and Solute Geochemistry for Determining Sources of Dissolved Sulfate in Groundwater, Southern Deer Lodge Valley, MT
Borduin, Michael	MS 1999	Geology and Hydrogeology of the Sand Creek Drainage basin, Southwest of Butte, MT
English, Alan	MS 1999	Hydrogeology and Geochemistry of the Silver Gate Area, Park County, MT
Hall, Todd	MS 1999	Post Construction Hydrogeology of Lower Area One, Butte, MT
Schaar, Melissa	MS 2000	Numerical Groundwater Flow and Contaminant Transport Model of the Bozeman Sanitary Landfill, Gallatin County, Montana
Goss, Lawrence	MS 2003	Hydrogeologic Evaluation of a Fractured Bedrock Flow System, Golden Sunlight Mine, Jefferson County, MT
Sudbrink, Andrew	MS 2008	Investigation of Contaminated Groundwater within the Comet Mine Reclamation Site, High Ore Creek, Drainage Basin, Southwestern MT
Husky, Amy	MS 2008	Groundwater Flow Assessment of the Upper Soda Butte Creek drainage Basin, Park County, MT and WY
Chandler, Kevin	MS 2009	The Hydrogeology of Riparian Areas in the Whitehall Basin, MT
Kuzara, Shawn	MS 2011	Groundwater Surface Water Interaction in the Alluvial Aquifer of the Middle Stillwater River Valley, Absorokee, Montana
Bryce, Gregory	MS 2011	An Evaluation of Artificial Groundwater Recharge as a Conjunctive Use Approach to Mitigating Surface Water Depletions in The Bitterroot Valley, Montana

Served as co-chair with significant input:

Metesh, John	MS 1990	Aquifer Testing and Evaluation of the Travonia and Marget Ann Mines
Drake, Vivian	MS 1991	Hydrogeological Characterization of the Helena Valley Aquifer System Based Upon Statistical Evaluation of Selected Groundwater Chemical Parameters
White, David	MS 1991	Aquifer Analysis and Stratigraphic Influences on Shallow-System Pumping Tests in the Helena Valley, Montana
DeRezende, Flavio	MS 1992	The Use of Conditional Simulation for Grade Control in a Gold Mine
Da Silva, Henrique	MS 1993	Geostatistics Applied to a Vein - Type Deposit - A Case Study
Reiser, Michael	MS 1997	Examination of the Mechanisms Influencing the Migration of Methane into Shallow Groundwater Systems Associated with Petroleum Wells near Lloydminster, Alberta, Canada.
Tillman, Eric	MS 1999	Industrial Facility Closure Investigation using Risk Analysis.
Milodragovich, Elizabeth	MS 2003	Hydrogeochemistry of a Natural Wetland Receiving Acid Mine Drainage, Ontario Mine, Powell County, Montana
Devakumar, Edwin D.	MS 2006	Modeling the flow of contaminants from coal ash deposited in a surface mine.

Crowell, Chris	MS 2008	Seismic Refraction Analysis for Water-Table Depth in a Shallow Tropical Aquifer near Cairns, Australia
Rich Labbe (MSU)	MS 2008	Watershed Restoration Limitations at the Abandoned Reclaimed Alta Mine, Jefferson County, MT
Jane Fillmore	MS 2009	Geochemical Interpretation and Remedial Design Evaluation of the Abandoned Alta Mine, Jefferson City, Montana.

Served as committee member:

Li, Chang Shun	MS 1989	Stratigraphic Correlation Package for IBM and Compatible Computers
Enberg, Chuck	MS 1990	Stripping of Chemical Contaminants During Immiscible Displacement
Botts, Tom	MS 1990	Computer Modeling of Seismic Wave Propagation in Transversely Isotropic Elastic Media Using a Finite-Difference Algorithm
Sjostrom, Keith	MS 1990	Determination of Groundwater Flow Parameters From Borehole-to-Surface Electrical Measurements
Brown, Vern	MS 1996	Evaluation of the Effectiveness of Grouting at the Mike Horse Mine, Montana
Reichardt, David	MS 1996	Application of Neural Networks to Borehole Geophysical Log Interpretations
Susan O'Neill	MS 1996	The Meandering INSTantaneous Diffusion (MIND) Model
Donovan, Tina	MS 1998	A comparison of Observed Concentration Fluctuations to Predictions from a Meandering Plume Model.
Bass, Karen	MS 1999	Prediction of the Two-Year Recurrence Interval Flood Event Ungaged Southwest Montana Streams Using Channel Geometry and Rosgen Classification
Johnstone, Samuel	MS 2001	Optimizing Well Locations to Delay the Effects of Coning.
Brosten, Troy R.	MS 2002	Mine Waste Mapping along Silver Bow Creek with ASTER and Probe-1
Wallace, Michael	MS 2005	Geoelectrical Characterization of geothermal Waters Near Warm Springs Montana.

HOBBIES

Racquetball, Fly Fishing & Camping, Snowboarding, Wood Carving of walking sticks, Running, Gold panning, Photography, Flint knapping, Painting, Crystal digging, and a bunch of other stuff.

[illegible]

2020/04/28

Flathead County Staff Proposed Findings—Rolling Acres	Revised Findings based on the reports of Kate McMahon, AICP, Wills Weight, Ph.D., PE, McGarvey Law, and the hearing record presented on behalf of the Fairview Neighborhood Association
<p>1. The proposed subdivision is anticipated to have an impact on agricultural facilities because the property is currently in agricultural production, the majority of soil types on the property are classified as prime farmland, and comment from the Flathead Conservation District indicates concerns regarding the loss of agricultural land; however, there would be minimal impacts to adjacent agricultural facilities and water user facilities as a result of the proposed subdivision because adjacent properties are not dependent upon the subject property for continued agricultural use, and the property has no irrigation infrastructure on site, is not in an irrigation district, and is not party to any irrigation agreements. [Condition 18]</p>	<p>1. The proposed subdivision is anticipated to have an impact on agricultural facilities because the property is currently in agricultural production, the majority of soil types on the property are classified as prime farmland, and comment from the Flathead Conservation District indicates concerns regarding the loss of agricultural land. <u>The proposed density of the subdivision fails to provide any ability to mitigate to address the 100% loss of prime farmland.</u></p> <ul style="list-style-type: none"> • Per Section 4.1.8(e), the Commission shall also consider the environmental assessment (Appendix C). The following concerns have been described regarding the standards in the environmental assessment and have not been adequately mitigated. <u>Approximately 85% of the land is classified as prime farmland. This land will be taken out of production.</u> (Part 1: (g)) • MCA 76-3-608. Criteria for local government review. <p>(4) The governing body may require the subdivider to design the proposed subdivision to reasonably minimize potentially significant adverse impacts identified through the review required under subsection (3). The governing body shall issue written findings to justify the reasonable mitigation required under this subsection (4).</p> <p>(5) (a) In reviewing a proposed subdivision under subsection (3) and when requiring mitigation under subsection (4), a governing body may not unreasonably restrict a landowner's ability to develop land, but it is recognized that in some instances, the unmitigated impacts of a proposed development may be unacceptable and will preclude approval of the subdivision.</p> • The proposed subdivision with 77 one-acre lots is a dramatic departure in density and character from the surrounding area. <u>The application incorrectly states that the most adjacent lands already support residential development.</u> As indicated by the maps in this report, and from the subdivision application, the surrounding area is a combination of large expanse of open space, cropland, forest/wetlands, and grassland with some limited large rural residential lots (5 to 10 acres) to the south. According to the staff report of the subdivisions that have occurred in the area, most have five or less lots with an average lot size ranging from 5 to 30 acres. The largest nearby subdivision is 28 lots and is 1.5 miles away on the south side of Montana 35. • The incompatible nature of the proposed land use is even more pronounced given that the land directly to the north is part of a conservation easement and another conservation easement is located within one-half mile to the south of the development. <u>These 900 acres of conservation easements permanently protect riparian habitat, wetlands, agriculture, and forest and contain important wildlife habitat for numerous wildlife species.</u> The subject property is a connecting parcel between these two conservation easements.

2. The proposed subdivision would have minimal impact on water and wastewater services as the property is not located within a water and sewer district, the proposed subdivision would utilize shared wells, individual septic systems, and a community sand mound septic system, and the water and wastewater systems would be required to be reviewed and approved by the Flathead City-County Health Department and the Montana Department of Environmental Quality as applicable.
[Conditions 2, 19]

2. Impacts from proposed water and wastewater services will not be acceptable because Per Section 4.1.7(b) of the Subdivision Regulations the Commission shall not approve a subdivision application unless the proposed subdivision conforms to all applicable design standards set forth in Section 4.7 FCSR (Subdivision Design Standards) and other provisions of these Regulations. The proposed development does not meet the following standards in Section 4.7:

- Evidence of water less than or equal to four feet was found in test pits #313, 321, 326 on March 3. Section 4.7. 5(c) discourages land division activities in areas with a shallow water table of four feet or less. The subdivision regulations require evidence that groundwater will not exceed the minimum vertical separation distance when groundwater is present within **five feet** of the surface. (Appendix B: R.iii) (Note: MCA Section 76-3-622(i)(d)(iii) requires that evidence of vertical separation be provided when groundwater is within seven feet of the surface.)
- **According to the report from Dr. Weight, the assumptions regarding flow and locations of the mixing zones are incorrect. Therefore, the non-degradation analysis is not valid.** Since the non-degradation analysis was based on inaccurate assumptions regarding groundwater flows, it has not been demonstrated that the development complies with Section 4.7.3, stating, “The design and development of subdivisions should not result in increased pollution to surface or groundwater supplies.”
- Additionally, since the assumption on groundwater flow is incorrect, the “Utility Detail” provided with the application does not contain an accurate depiction of the location of the mixing zones. Additionally, the Administrative Rules of Montana state: “17.30.506(b) the existence of a drinking water intake, a zone of influence around a drinking water well or a well-used for recreational purposes, or a recreational area within or immediately adjacent to the proposed mixing zone will support a finding that a mixing zone is not appropriate.” The “utility detail” that was submitted with the plat indicated a number of mixing zones that did not comply with the above standard. When a revised “utility detail” is submitted, it will be necessary to evaluate the lot layout to determine if it meets the above standard. P. 5 McMahon Report
- **Photo evidence, soil surveys, and other evidence indicate the property is subject to high groundwater. Section 4.7.12 such land shall be “unsuitable for wastewater treatment and construction”** Section 4.7.3 states subdivisions should not pollute groundwater.
- The Administrative Rules for Montana (ARM – 17.36.323) requires a 25’ setback for drainfields from stormwater ditches. Lots 62, 9, and 19 appear to be in the setback required for the proposed infiltration ditch. Lot 70, Lot 9, and Lot 10, as well as the drain field between lot 78 and lot 79, appear to be within 25’ of the drainage ditch along the road. A 100’ setback from the floodplain for drainfields may be required for

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lots 63-68 depending on the type of drainfield system. The back-up drainfields for lots 17-24 appear to be in the required setback from Columbia Falls Stage Road. (See MCA 76-4-104(5)(i))

- The Administrative Rules for Montana (ARM – 17.36.323) requires a 100’ setback for drainfields from drinking wells. The drainfield on lot 10 appears to be in the required setback for the well on lot 7. The well isolation zone for lot 8 is not shown on the utility detail, so it can’t be determined if the drainfield for this lot meets the setback requirements.
- The subdivision regulations require a 15’ easement for a bike path along Columbia Falls Stage Road. (Section 4.7.19). The drainfields for lots 17, 18, 19, 20, 21, 22, 23, and 24 would encroach on this easement. ARM Section 17.36.322 (4) prohibit drainfields from being in areas subject to compaction. Section 4.17.19 requires trails to be constructed according to AASHTO guidelines. This may also be an issue for the lots on the north perimeter of the subdivision, as well as driveways and parking areas on individual lots.
- The preliminary plat indicates that there will be a small community sand mound system that will serve lots 77, 32, 31, 30, and 29. The utility detail does not show the easement for the sewer lines that are necessary to provide service to the lots on the system. Although a homeowner agreement is required to be submitted with the preliminary plat to provide information on operation and maintenance of the system, it was not provided with the application. (See Section C of McMahon report & ARM 17.36.326)
- The National Wetlands Inventory depicts a significant wetland area directly adjacent to the proposed subdivision within 100’ of the north property line. The application materials indicate that lots 62, 64, 65, 66, 67, and 68 have septic drainfields that abut the north property line and would be located within the recommended buffer area from a wetland. The FWP document also recommends that if any proposed subdivision design features are located 150 feet or less from a wetland, the subdivider retains a qualified wetland professional to determine the wetland’s boundary. The FWP documents note that if the wetlands and wetland complexes are important for migrating game birds and/or shorebirds, biologists may recommend that the total building setback be extended to encompass specific cropland areas adjacent to the wetlands that are consistently and seasonally used by large numbers or a high diversity of these species. The staff recommended condition does not provide any buffer for the wetland areas in or adjacent to the subdivision.
- Since the non-degradation analysis for surface water did not examine the wetland area to the north, it has not been demonstrated that the development complies with Section 4.7.3 FCSR stating, “The design and development of subdivisions should not result in increased pollution to surface or groundwater supplies.”

	<ul style="list-style-type: none"> Per section 4.7.10 FCSR, there is a “no build zone” to protect the wetland on Lot 71. The “no build zone” does not meet FWP standards. The subdivision does not comply with FWP standards for development within 100 – 150’ of a designated wetland. Denial of the subdivision is allowed for non-compliance with numerous subdivision requirements outlined in these findings that the county has the authority to enforce under MCA §76-3-608. 76-3-608 Criteria for local government review. (6) A governing body may conditionally approve or deny a proposed subdivision as a result of the water and sanitation information provided pursuant to <u>76-3-622</u>, or public comment received pursuant to <u>76-3-604</u> on the information provided pursuant to <u>76-3-622</u> only if the conditional approval or denial is based on existing subdivision, zoning, or other regulations that the governing body has the authority to enforce.
<p>3. Impacts on solid waste disposal would be acceptable with standard conditions because all lots within the proposed subdivision would utilize contract haul services for solid waste management. [Conditions 9, 12]</p>	
<p>4. The road system appears to be acceptable with conditions because primary access to the subdivision would be via Columbia Falls Stage which is a paved, County-maintained road, access to each lot within the subdivision would be via paved internal subdivision roads, the proposed subdivision has the potential to increase traffic on Columbia Falls Stage by 56%, existing roads appear capable of accommodating the increase in traffic, a road user’s agreement or CC&R’s will be required for internal subdivision roads, and</p>	<p>4. The road system, as proposed, <u>is not acceptable</u> for the following reasons:</p> <ul style="list-style-type: none"> The proposed access roads off of Columbia Falls Stage do not comply with ARM Adopting 2012 International Fire Code: http://www.mtrules.org/gateway/RuleNo.asp?RN=23%2E12%2E601 2012 International Fire Code – Appendix D: https://up.codes/viewer/north_carolina/ifc-2009/chapter/D/fire-apparatus-access-roads#D In regard to compliance with the standard in questions. <ul style="list-style-type: none"> The separation between the two access roads is approximately 1400’. The diagonal measured from Lot 71 to lot 24 is approximately 2900’. Based on this measurement, the required separation between the access roads is 1450’ (1/2 of the diagonal). The diagonal measured from Lot 1 to lot 77 is approximately 3200’. Based on this measurement, the required separation is 1600’. The traffic study notes that Fairview is an alternate route, the hearing record shows that <u>Fairview is a gravel road that is sometimes underwater, snow or ice and may not be a viable alternative under certain circumstances.</u>

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<p>approach permits from the Flathead County Road and Bridge Department will be required for the approaches onto Columbia Falls Stage. [Conditions 5, 6, 20]</p>	<ul style="list-style-type: none">• The Montana Department of Transportation (MDT), “Traffic Engineering Manual,” recommends that traffic impact study include sections on sight distances and adequacy of turn lanes (Section 41.4.2.3). The MDT “Roadway Design Manual” notes that sight distance will be, “... an issue where the major road is on a horizontal curve, where there is a median, or where there are opposing vehicles making left turns at the intersection.” (Section 2.8.2). <u>Although these conditions exist for the MT 35/Columbia Falls Stage Rd. intersection, there was no analysis on sight distances and no review by MDT of the Traffic Impact Study. The traffic study also did not account for projected traffic from recently approved subdivisions in the area.</u>• The traffic impact study indicates that after development of the subdivision, the Columbia Falls Stage Road/MT 35 intersection will remain within the parameters of a LOS C ranking. The study, however, indicates that delay time and number of cars in a queue increases for southbound vehicles that are making left turns onto MT 35.• According to the traffic study, the proposed subdivision has the potential to increase traffic on Columbia Falls Stage by 56%. The hearing record includes numerous comments from residents of the area as to safety concerns on this two-lane road, including speeding and lack of shoulders.
<p>5. Impacts on local services with regard to schools, mail delivery, and recreation would appear to be acceptable with conditions as the proposed subdivision would add approximately 27 students to the local school district, the applicant will be required to submit written approval from the local postmaster prior to final plat approval, the proposed open space areas would satisfy the parkland dedication requirements, and a 15-foot wide pedestrian and bicycle path easement would be required along Columbia Falls Stage. [Conditions 8, 21]</p>	<p>5. The proposed open space area fails to satisfy the parkland dedication requirements in Section 4.7.24 FCSR. Impacts on local services with regard to schools, mail delivery, and recreation would appear to be acceptable with conditions.</p> <ul style="list-style-type: none">• The proposed open space does not meet the criteria for parkland dedication in Section 4.7.24.• Section 4.7.24(d)iii of the subdivision regulations allows the County to accept open space in lieu of a park dedication if it meets the following criteria: “The proposed subdivision provides long-term protection of critical wildlife habitat; cultural, historical, or natural resources; agricultural interests; or aesthetic values.” The open space does not protect cultural, historical, agricultural, or natural resources, and FWP has submitted comments that “The open space provided is a powerline corridor and will not function as wildlife habitat or provide a useful movement corridor.” The presence of transmission lines in the corridor negates any aesthetic value. <u>This analysis indicates the BPA easement does not meet the criteria for waiving the parkland dedication requirement.</u>• According to the staff report, the required parkland dedication is calculated at 4.67 acres. The application states that the BPA easement will remain as open space and encompasses 9.86 acres. The county may waive this requirement for parkland dedication if the development meets one of the criteria in Section 4.7.24(d)FCSR. The staff report indicates that the application meets the criteria of this section because a trail will be constructed in the BPA easement providing recreational value and qualifying the open space as “parkland.” The criteria in section 4.7.24(d) FCSR, however, states that such parkland must be “permanently” dedicated. The trail can only be constructed under a land use agreement with BPA. Such

	<p>agreements typically have a term of use and are not issued in perpetuity. <u>Therefore, the trail does not meet the criteria for permanent parkland.</u></p> <ul style="list-style-type: none"> • Additionally, a single trail with no other amenities, has limited recreational value for a large development. Another issue with classifying this open space as “parkland” is that there are several mixing zones from nearby drainfields that encroach on the BPA easement. <u>The ARM 17.30.506(b) restricts mixing zones in recreational areas, and the lot layout would need to be modified to comply with this standard.</u>
<p>6. Impacts from stormwater runoff will be acceptable because stormwater generated by impervious surfaces within the proposed subdivision will be accommodated via onsite ditches and drywells and the proposed stormwater management plan will require review and approval through the Flathead City-County Environmental Health Department and Montana Department of Environmental Quality. [Conditions 2, 14]</p>	<p>6. Impacts from stormwater runoff <u>will not be acceptable</u> because the design of the stormwater system does not comply with the required elements of the Administrative Rules of Montana and requirements of the Flathead County Subdivision Regulations, including:</p> <ul style="list-style-type: none"> • The Administrative Rules for Montana (ARM – 17.36.323) requires a 25’ setback for drainfields from stormwater ditches. Lots 62, 9, and 19 appear to be in the setback required for the proposed infiltration ditch. Lot 70, Lot 9, and Lot 10, as well as the drain field between lot 78 and lot 79, appear to be within 25’ of the drainage ditch along the road. A 100’ setback from the floodplain for drainfields may be required for lots 63 -68 depending on the type of drainfield system. The back-up drainfields for lots 17-24 appear to be in the required setback from Columbia Falls Stage Road. (See MCA 76-4-104(5)(i)) • Per Section 4.1.8(f), in making its decision, the Commission shall also consider the following agency comments. Following concern has not been mitigated: The Flathead Conservation District concerns with increased pollution from stormwater run-off entering the Flathead River. Comments from the Flathead Conservation District noted: “The location of the proposed development also poses potential, long-term impacts to Flathead River from Nonpoint Pollution. As reported in the Flathead lake Watershed Restoration Plan, developed areas on the lower Flathead River contribute significant pollution to Flathead River, and subsequently, Flathead Lake. The increase of impermeable surfaces from the development will result in increased stormwater runoff entering Flathead River and reduce groundwater infiltration to underground aquifers.” • The proposed drainage ditches will require “Shallow excavations.” As indicated in the McMahon Report, p.10, the NRCS soil survey rates the soils on the subject property as either “very limited” or “somewhat limited” for shallow excavations. “Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, the amount of large stones and dense layers influence the ease of digging, filling, and compacting. Depth to seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water

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	<p>table and linear extensibility (shrink-swell potential) influence the resistance to sloughing.” https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm</p>
<p>7. Impacts on fire, emergency medical, and police services would be minimal with standard conditions because the subdivision would be served by the Creston Fire District and Flathead County Sheriff’s Office in the event of an emergency, the property is not located in a Wildland Urban Interface or Fire District Priority Area, and the applicant would be required to meet the requirements of the fire district prior to final plat approval. [Condition 3]</p>	<p>7. Impacts on fire, emergency medical, and police services have been identified by the Creston Fire Department and the Flathead County Road Department, and these <u>have not been mitigated</u>. The proposed road accesses to the property fail to meet the 2012 International Fire Code, which has been adopted by the state of Montana and by Flathead County. The proposed development is within the Wildland Urban interface and <u>does not comply with Section 4.7.27 FCSR</u>,</p> <ul style="list-style-type: none"> • According to the Flathead County Community Wildfire and Protection Plan and the Pre-Disaster Mitigation Plan, the subject property is in the “Wildland Urban Interface” is required to comply with Section 4.7.27 FCSR. <u>The applicant did not submit a Fire Prevention and Fuels reduction plan as required</u>. The application did not contain any statement of probable impact by being in the WUI or measures to mitigate any adverse impacts associated with area hazards. (The Pre-Disaster Mitigation Plan (PDMP) adopted in 2014 does not include the subject parcel in the WUI. It does indicate that the forested area directly north of the property is classified as WUI. The PDMP also states the following, “When subdivision development is proposed or occurs that is physically outside the established WUI area as adopted by Flathead County, then the WUI boundary will automatically include the subdivision development.” (pg. 4-20). Therefore, according to the PDMP, the WUI is automatically expanded to include the development.) • The proposed access roads off of Columbia Falls Stage do not comply with ARM Adopting 2012 International Fire Code: http://www.mtrules.org/gateway/RuleNo.asp?RN=23%2E12%2E601 2012 International Fire Code – Appendix D: https://up.codes/viewer/north_carolina/ifc-2009/chapter/D/fire-apparatus-access-roads#D <p>In regard to compliance with the standard in questions.</p> <ul style="list-style-type: none"> ○ The separation between the two access roads is approximately 1400’. ○ The diagonal measured from Lot 71 to lot 24 is approximately 2900’. Based on this measurement, the required separation between the access roads is 1450’ (1/2 of the diagonal). ○ The diagonal measured from Lot 1 to lot 77 is approximately 3200’. Based on this measurement, the required separation is 1600’. <ul style="list-style-type: none"> • Per Section 4.1.8(f) FCSR, in making its decision, the Commission shall also consider agency comments. The following concerns have not been mitigated: <ul style="list-style-type: none"> ○ The Creston Fire Department expressed concern with the amount of traffic that would “dump” onto an already busy Columbia Falls Stage Road. The Department also noted that the application does

	<p>not discuss challenges of the BPA easement on access and safety. The traffic impact study submitted with the application did not discuss concerns regarding emergency evacuation.</p> <ul style="list-style-type: none"> o The Creston Fire Department also noted that a fire hydrant system is preferred. The applicant, however, is proposing a tanker recharge site at the corner of Wiedy Lane and Meadow Lark Drive – adjacent to the BPA easement. (See lot layout sheet 1). No maintenance plan for the recharge area has been submitted as required. The Fire Department comments note that if a recharge facility is chosen, the minimum usable gallonage will be 30,000 with a minimum 500gpm discharge pump. This calculation does not account for the subject property being in the Wildland Urban Interface. o Creston Fire Department concern with traffic safety at Columbia Falls Stage Road & Highway 35. o Creston Fire Department concern with access on Columbia Falls Stage Road during emergency situations o Flathead County Public Works is concern with increased transportation safety hazards due to significant traffic from a large development.
<p>8. Impacts to noise and air quality are anticipated to be minimal with the imposition of conditions because impacts of noise from the residential development are not expected to extend beyond property lines, the primary access roads to the subdivision will be paved, and a Dust Control Plan will be required to mitigate potential issues of dust during construction. [Conditions 10, 12]</p>	
<p>9. Impacts to public health and safety from high-pressure gas lines or airport influence areas are not anticipated because no high-pressure gas lines are located on the subject property and the property is not located within an airport influence area, and impacts from high voltage electric lines</p>	<p>9. Impacts to public health and safety from high voltage electric lines have been identified and have not been mitigated and are a basis for denial of this subdivision. Impacts to public health and safety from high-pressure gas lines or airport influence areas are not anticipated.</p> <ul style="list-style-type: none"> • <u>There has been a history of landslides near the subject area. Section 4.7.4 and 4.7.5 (c) states that land division should be discouraged or prohibited in such areas.</u> Another concern is the potential for erosion and the impact on the BPA transmission towers. A flood in 2014 caused a landslide just over 200 yards from the north property line. This landslide required the relocation of a transmission tower. The report from the hydrologist indicates a heightened risk for a similar event due to alterations in the flow of the shallow groundwater that would result from the development of the property.

would be minimal with conditions because all activities within the **BPA** right-of-way would be required to be permitted by BPA prior to installation or construction. [Condition 18]

- There is a high-power transmission line that transects the property. This has been identified as a hazard in the subdivision regulations (Section 4.7.4 and 4.7.5 FCSR).
- Per Section 4.1.8(f) FCSR, in making its decision, the Commission shall also consider the following agency comments.
 - The Bonneville Power Agency comments describe the potential conflicts with the proposed high-density residential development.
 - “BPA does have some concerns with activity that may occur with the Rolling Acres Subdivision .. and proposed lots (numbered 1,2,3,4,5,27,28,39 and 40) intended for residential lots as well as the subdivision’s sections of Meadow Lark Drive, Snow Peak Road, Jala Lane and Wiedy Land which cross BPA’s right of way.”
 - BPA easements are taken with certain restrictions on the underlying land. In order to maintain operation and safety criteria, all activities planned within the BPA right-of-way need to be approved by BPA **prior** to their occurrence.”
- The application includes a “Conceptual Grading & Storm Drainage Plan” (Sheet 4 of 5) that indicates the storm drainage and runoff will be retained and treated on individual lots as well as through an infiltration ditch. The infiltration ditch crosses the BPA Easement and will require a land use agreement with BPA for construction, which has not been secured or provided.
- The application material did not include the required easement language, which would indicate the restrictions on the underlying land and include the location of BPA structures/transmission towers. BPA has setback requirements from the towers, which may affect the location of roads, ditches, trails, or other improvements in the easement. The BPA Landowners Guide includes the following regarding construction within the easement.
 - Maintain at least 50 feet of clearance from BPA’s poles, structures, or guy wires, whether it be vegetation, roads, fences, utilities, pipelines, or any other improvements.
 - Maintain at least 25 feet of clearance from the top of any vegetation and the lowest point of BPA’s wires. Identify the species of the vegetation you propose to plant in the right-of-way so that BPA can consider the mature height of the vegetation.
 - Design roads, underground utilities, and pipelines to withstand HS-20 loadings (a federal highway standard).

	<ul style="list-style-type: none"> In regard to pedestrian/bicycle facilities, the application states that a recreational trail will be provided along the perimeter and within the BPA right-of-way, yet no easement for this use has been provided, nor has its safety been evaluated.
<p>10. No impacts from geological and avalanche hazards are anticipated because the subject property is relatively flat and there is no evidence of unstable soils, rock outcroppings, falls, or slides indicating significant geologic hazards on the property.</p>	<p>10. Major impacts from erosion and landslides near the subject area have been identified in both the Willis and McMahon reports and in exhibits in the hearing record. Section 4.7.4 and 4.7.5 (c) states that land division should be discouraged or prohibited in such areas.</p> <ul style="list-style-type: none"> There has been a history of landslides near the subject area. Section 4.7.4 and 4.7.5 (c) states that land division should be discouraged or prohibited in such areas. See P. Area Hazards p.23, McMahon report.
<p>11. Impacts to the natural environment as a result of the proposed subdivision are expected to be minimal with conditions because the applicant will be required to provide an approved weed control plan prior to final plat approval, the subject property does not contain riparian areas and is located outside of the 0.2% annual chance flood hazard area, and impacts to wetland areas would be mitigated by a 'No Build Zone' on the face of the final plat. [Conditions 4, 12, 22]</p>	<p>11. Impacts to the natural environment as a result of the proposed subdivision are significant and are a basis for denial of this subdivision, including the following:</p> <ul style="list-style-type: none"> Evidence of water less than or equal to four feet was found in test pits #313, 321, 326 on March 3. Section 4.7. 5(c) discourages land division activities in areas with a shallow water table of four feet or less. Since the non-degradation analysis for surface water did not examine the wetland area to the north, it has not been demonstrated that the development complies with Section 4.7.3, stating, "The design and development of subdivisions should not result in increased pollution to surface or groundwater supplies." Since the non-degradation analysis was based on inaccurate assumptions regarding groundwater flows, it has not been demonstrated that the development complies with Section 4.7.3, stating, "The design and development of subdivisions should not result in increased pollution to surface or groundwater supplies." Photo evidence, soil surveys, and other evidence indicate the property is subject to high groundwater. Section 4.7.12 such land shall be "unsuitable for wastewater treatment and construction." Section 4.7.3 states subdivisions should not pollute groundwater. Per section 4.7.10, there is a "no build zone" to protect the wetland on Lot 71. The "no build zone" does not meet FWP standards. The subdivision does not comply with FWP standards for development within 100 – 150' of a designated wetland.

	<ul style="list-style-type: none"> • Per Section 4.1.7 (f) of the Subdivision Regulations, the Commission shall not approve a subdivision application unless the proposed subdivision complies with other applicable regulations. Furthermore, Section 4.7.12 – Groundwater, Section 4.7.13 – Drainage Facilities, Section 4.7.20 – Water Supply, and Section 4.7.21 – Sewage, state that developments must comply with the minimum rules and standards adopted by the Montana Department of Environmental Quality (DEQ). Such rules and standards are found in the Montana Code Annotated (MCA), Administrative Rules of Montana, and DEQ design circulars. This review indicates the proposed development does not comply with the following rules and standards as adopted by DEQ: <ul style="list-style-type: none"> ○ Lots 62, 9, 19, 70, 10, 78, 79, 17, 18, 19, 20, 21, 22, 23, 24 do not meet the required setback for drainfields from storm water ditches. (ARM 17.36.323) ○ The drainfields may encroach on the well isolation zone for lots 7 & 8. (ARM 17.36.323) ○ The lots abutting the trail easements on the north and east boundaries encroach on the trail easement. (ARM 17.36.322(4)) ○ Since the assumptions for the location of the mixing zones were incorrect, it is not possible to evaluate compliance with the ARM 17.30.506(b) regarding mixing zones and the zone of influence for drinking water wells. ○ The wells for lots 17 through 23 appear to have a well within 25' of the property line, and this does not comply with the 50' setback requirement in the MCA 76-4-104(5)(i) ○ The small size of the lots limit options for meeting setback requirements in the ARM, MCA, and subdivision regulations. • Per Section 4.1.8(e), the Commission shall also consider the environmental assessment (Appendix C). The following concerns have been described regarding the standards in the environmental assessment and have not been adequately mitigated. <ul style="list-style-type: none"> ○ Part 1: (a) Surface Water - The non-degradation analysis included with the application did not consider potential contamination of the wetland/surface water within 100' north of the subdivision boundaries. ○ Part 2: (e)(viii) – Roads – The traffic study did not comply with the MDT “Traffic Engineering Manual” to include sections on sight distance and adequacy of turn lanes. The MDT “Roadway Design Manual” notes that sight distances are a concern on major roads with a horizontal curve and where opposing vehicles are making left turns at the intersection. ○ Approximately 85% of the land is classified as prime farmland. This land will be taken out of production. (Part 1: (g)) ○ The density and character of the development is out of character with the surrounding land use. (Part 2: Section (i)) • Per Section 4.1.8(f), in making its decision, the Commission shall also consider the following agency comments. Following is a summary of concerns from agency comments that have not been mitigated.
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	<ul style="list-style-type: none"> ○ Flathead Conservation District concerns with increased pollution from stormwater run-off entering the Flathead River. ○ Creston Fire Department concern with traffic safety at Columbia Falls Stage Road & Highway 35. ○ Montana Department of Fish, Wildlife and Parks state that the proposed subdivision will result in the “significant loss of wildlife habitat and connectivity along the riparian movement corridor.” ○ The Flathead Conservation District notes that subject property is mostly prime farmland and these farmlands only comprise 1 percent of the land in Flathead County. Farmable acreage is decreasing in Flathead County. ○ The Bonneville Power Agency comments describe the potential conflicts with the proposed high-density residential development.
<p>12. Impacts to wildlife and wildlife habitat are anticipated due to the scale of the proposed subdivision which would be developed within a large agricultural area which serves as wildlife habitat and movement corridors for a variety of species, however, the property does not contain habitat species of concern generally reside in, and human-wildlife conflict could be minimized by implementing the conditions recommended by Montana Fish, Wildlife and Parks recommended conditions into CC&Rs for the subdivision. [Condition 23]</p>	<p>12. Impacts to wildlife and wildlife habitat are anticipated due to the scale of the proposed subdivision, and as proposed, <u>this subdivision fails to adequately mitigate impacts to wildlife and provides no mitigation for loss of wildlife habitat in conflict with 4.7.3 FCSR.</u> While the staff report recommends some conditions to reduce human-wildlife conflicts, there are no proposed mitigation measures or conditions to address the loss of wildlife habitat.</p> <ul style="list-style-type: none"> • Section 4.7.3 FCSR states that the subdivision shall preserve wildlife habitats to the extent possible. Parts of the subdivision and adjoining land is classified as Tier 1 Habitat. The remaining land is Tier 2 habitat. <u>The proposed development will result in 100% of the 114 acres being lost as wildlife habitat.</u> • The Flathead County subdivision regulations state that proposed subdivisions in locations with wetlands, in areas with rare and endangered species, or that are adjacent to critical habitat (as defined by state or federal agencies) are “presumed to have an impact on wildlife habitat.” <u>The subject property meets all three of these criteria. While the staff report recommends conditions to reduce human-wildlife conflicts, there are no proposed mitigation measures or conditions to address the loss of wildlife habitat.</u> • Montana Department of Fish, Wildlife and Parks (FWP) commented that the subject property is located in close proximity to two large conservation easements cover some 900 acres and wetlands and agricultural land that provide wildlife habitat and movement corridors. Specifically, agricultural land on the subject property provides spring nesting habitat and fall feeding for migratory waterfowls and other birds. <u>The proposed high density develop will “eliminate all nesting, foraging and cover potential for migratory waterfowl and upland game birds.</u> • <u>The National Wetlands Inventory depicts a significant wetland area directly adjacent to the proposed subdivision within 100’ of the north property line.</u> The application materials indicate that lots 62, 64, 65, 66, 67, and 68 have septic drainfields that abut the north property line and would be located within the

	<p>recommended buffer area from a wetland. The FWP document also recommends that if any proposed subdivision design features are located 150 feet or less from a wetland, the subdivider retains a qualified wetland professional to determine the wetland's boundary. <u>The FWP documents note that if the wetlands and wetland complexes are important for migrating game birds and/or shorebirds, biologists may recommend that the total building setback be extended to encompass specific cropland areas adjacent to the wetlands that are consistently and seasonally used by large numbers or a high diversity of these species. The staff recommended condition does not provide any buffer for the wetland areas in or adjacent to the subdivision.</u></p> <ul style="list-style-type: none"> • <u>The State Wildlife Action Plan classifies a portion of the site and property adjacent to the site as "Tier I. Greatest conservation need. There is a clear obligation to use resources to implement conservation actions that provide direct benefit to these community types."</u> http://fwp.mt.gov/fishAndWildlife/conservationInAction/actionPlan.html • Per Section 4.1.8(f) FCSR, in making its decision, the Commission shall also consider the following agency comments. Following is a summary of concerns from agency comments that have not been mitigated. <ul style="list-style-type: none"> ○ Montana Department of Fish, Wildlife and Parks states that the proposed subdivision will result in the "significant loss of wildlife habitat and connectivity along the riparian movement corridor." ○ The Flathead Conservation District notes that subject property is mostly prime farmland and these farmlands only comprise 1 percent of the land in Flathead county. Farmable acreage is decreasing in Flathead County. ○ The Bonneville Power Agency comments describe the potential conflicts with the proposed high-density residential development.
13. The proposed subdivision would not adversely impact historical features because there are no known historical, archeological, or cultural sites on the subject property.	
14. The preliminary plat would conform to all provisions of the Montana Subdivision and Platting Act if it contains all elements required to meet state survey requirements, which would be	<p>14. The preliminary plat fails to conform to the required provisions of the Montana Subdivision and Platting Act. Per Section 4.1.7(b) of the Subdivision Regulations, <u>the Commission shall not approve a subdivision application unless the proposed subdivision conforms to all applicable design standards set forth in Section 4.7 (Subdivision Design Standards) and other provisions of these Regulations.</u> The proposed development does not meet the following standards in Section 4.7:</p> <ul style="list-style-type: none"> • 4.7.7 discourages through lots. Lots 17, 18, 19, 20, 21, 22, and 23 are through lots.

determined when it is reviewed by the Flathead County Examining Land Surveyor prior to final plat approval. [Condition 13]

- Evidence of water less than or equal to four feet was found in test pits #313, 321, 326 on March 3. Section 4.7. 5(c) discourages land division activities in areas with shallow water table of four feet or less.
- Since the non-degradation analysis for surface water did not examine the wetland area to the north, it has not been demonstrated that the development complies with Section 4.7.3, stating, “The design and development of subdivisions should not result in increased pollution to surface or groundwater supplies.”
- Since the non-degradation analysis was based on inaccurate assumptions regarding groundwater flows, it has not been demonstrated that the development complies with Section 4.7.3 stating, “The design and development of subdivisions should not result in increased pollution to surface or groundwater supplies.”
- Photo evidence, soil surveys, and other evidence indicate the property is subject to high groundwater. Section 4.7.12 such land shall be “unsuitable for wastewater treatment and construction.” Section 4.7.3 states subdivisions should not pollute groundwater.
- According to the Flathead County Community Wildfire and Protection Plan and the Pre-Disaster Mitigation Plan, the subject property is in the “Wildland Urban Interface” is required to comply with Section 4.7.27
- Per section 4.7.10, there is a “no build zone” to protect the wetland on Lot 71. The “no build zone” does not meet FWP standards.
- The subdivision does not comply with FWP standards for development within 100 – 150’ of a designated wetland.
- Section 4.7.3 states that the subdivision shall preserve wildlife habitats to the extent possible. Parts of the subdivision and adjoining land is classified as Tier 1 Habitat. The remaining land is Tier 2 habitat. The proposed development will result in 100% of the 114 acres being lost as wildlife habitat.
- The proposed open space does not meet the criteria for parkland dedication in Section 4.7.24.
- There has been a history of landslides near the subject area. Section 4.7.4 and 4.7.5 (c) states that land division should be discouraged or prohibited in such areas.
- There is a high-power transmission line that transects the property. This has been identified as a hazard in the subdivision regulations (Section 4.7.4 and 4.7.5).

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	<p>Additionally, the application lacks the following documentation as required per the Flathead County Subdivision Regulations – Appendix B: Application and Preliminary Plat Supplements. These documents are necessary to evaluate compliance with the subdivision requirements and to make the necessary findings of fact per Section 4.1.8.</p> <ul style="list-style-type: none"> • Fire Prevention Control and Fuels Reduction Plan (Section E) • Bonneville Power Association Utility Easement & location of BPA structures (Section I & L) • Home Owners Agreement (Section M) • Wells/wastewater systems within 100’ of the subdivision south of Kingfisher Ln. (Section Q) • Proposal to reserve water rights and landowner’s water use agreement (Section W) • The location and width of easements are not shown for infiltration ditch or the multi-user wastewater system. (Section CC –) • Complete groundwater monitoring data (Section R & 4.7.12) & <p>The also application lacks the following documentation as required per the Flathead County Subdivision Regulations – Appendix C: Environmental Assessment.</p> <ul style="list-style-type: none"> • Wildland Urban Interface Impact statement and mitigation measures (Section L.i.A) • Stormwater operation and maintenance plan (Part 2: Section C)
<p>15. The proposed subdivision has been reviewed as a major subdivision in accordance with statutory criteria and standards outlined in Section 4.4 of the Flathead County Subdivision Regulations effective December 3, 2018.</p>	<p>15. The application is insufficient because it lacks materials and information required by Appendix B and Appendix C of the subdivision regulations. (See Section C of the McMahon report.) Without such information, it is not possible to evaluate compliance with standards, and the public does not have the opportunity to review and comment on a complete submittal.</p>
<p>16. The preliminary plat identifies adequate easements for utilities to serve the subdivision. All other easements associated with this subdivision and the subdivided</p>	<p>16. The preliminary plat <u>fails</u> to identify adequate easements for utilities to serve the subdivision or to assure wellhead protection for individual property owners. Per Section 4.1.7 (a) of the Subdivision Regulations, the Commission shall not approve a subdivision application unless the proposed subdivision assures easements for the location and installation of any planned utilities, roadways, pedestrian and bike trails, or other easements required by the Commission shall be shown on the final plat. The proposed lot layout plan does not indicate the</p>

property shall be clearly located on the Final Plat to satisfy applicable requirements of the Montana Subdivision and Platting Act and the Flathead County Subdivision Regulations. [Condition 13]

actual location of the following easements. This information should be available at the preliminary plat stage to ensure compliance with required setbacks and other rules.

- Easement for proposed infiltration ditch that is shown on the conceptual grading and storm drainage plan.
- Easement for sewer lines from the community sand mound system to lots 77, 32, 31, 30, and 29.
- Land use agreement with BPA for construction of roads, trail, and infiltration ditch on the BPA easement.
- Adequate information on the above easements provided prior to approval of the preliminary plat to allow for public review.
- The well isolation zone for lots 17, 18, 19, 20, 21, 22, and 23 extend outside the boundaries of the subdivision onto the right-of-way for Columbia Falls Stage Road. According to the site plan's utility detail (sheet 3 of 5), it appears the wells are located within 25' of the property line and do not meet the following MCA criteria. MCA 76-4-104(5)(i): "A proposed mixing zone or a proposed well isolation zone for an individual water system well that is a **minimum of 50 feet inside** the proposed subdivision may extend outside the boundaries of the proposed subdivision onto adjoining land that is dedicated for use as a right-of-way for roads, railroads or utilities." P 7, McMahon Report
- When a well isolation zone extends outside the property boundaries, there should be a means to ensure that the adjoining property owner will not engage in activities that can compromise water quality within the isolation zone. Either easements or Covenants, Conditions, and Restrictions (CC&Rs) are a means to restrict such activities. If the terms of the easement or CC&Rs are violated, the aggrieved party can take civil action to remedy the situation. The utility detail that was submitted with the application indicates that there are many instances where the well isolation zones and "mixing zones" encroach on adjoining lots or extend to lots across the road. There are no proposed easements for these lots, and the CC&Rs do not contain any conditions to restrict inappropriate activities in these areas. If the subdivision is approved without such restrictions, individual property owners will lack a means to protect drinking water. P 7, McMahon Report

17. **The preliminary plat includes adequate provisions for legal and physical access to the subdivision and all lots within it** because Columbia Falls Stage would provide access to the subdivision, and the proposed internal subdivision roads

17. See Finding 4 of this section which also explains the failure of the current proposal to meet the required standards.

<p>would provide access to each lot. [Condition 20]</p>	
<p>18. The proposed subdivision generally complies with the Flathead County Growth Policy and the zoning regulations because the proposed subdivision is not zoned and proposal conforms to the regulations used in the review of subdivision in Flathead County.</p>	<p>18. The proposed subdivision fails to comply with the Flathead County Growth Policy because Per Section 4.1.8(d) FCSR the Commission shall also consider the growth policy. Since the application does not comply with appropriate rules and regulations, it does not conform to the relevant goals and policies that have been excerpted within this report.</p> <ul style="list-style-type: none"> • Additionally, the McMahon report identifies 53 goals or policies that this proposed development is not in consistent with.
<p>VI. CONCLUSION</p> <p>In accordance with the provisions of Section 4.4 of the Flathead County Subdivision Regulations, a review and evaluation of the major subdivision application has been completed by the staff of the Flathead County Planning and Zoning Office. The proposed subdivision appears to generally comply with the subdivision review criteria found in Section 4.7 FCSR, pursuant to the draft Findings of Fact prepared herein, or identified impacts can be mitigated with conditional of approval. Should the Flathead County Board of Commissioners choose to grant preliminary plat approval of this subdivision, the following draft conditions should be considered to supplement the decision and mitigate impacts</p>	<p>CONCLUSION</p> <p>The proposed subdivision fails to generally comply with the subdivision review criteria found in Section 4.7 FCSR, pursuant to the draft Findings of Fact prepared herein, or identified impacts which have not or can not be mitigated with conditional of approval. For these reasons this subdivision should be denied.</p> <p>76-3-501. Local subdivision regulations. The governing body of every county, city, and town shall adopt and provide for the enforcement and administration of subdivision regulations reasonably providing for:</p> <ol style="list-style-type: none"> (1) the orderly development of their jurisdictional areas; (2) the coordination of roads within subdivided land with other roads, both existing and planned; (3) the dedication of land for roadways and for public utility easements; (4) the improvement of roads; (5) the provision of adequate open spaces for travel, light, air, and recreation; (6) the provision of adequate transportation, water, and drainage; (7) subject to the provisions of <u>76-3-511</u>, the regulation of sanitary facilities; (8) the avoidance or minimization of congestion; and (9) the avoidance of subdivisions that would involve unnecessary environmental degradation and danger of injury to health, safety, or welfare by reason of natural hazard, including but not limited to fire and wildland

anticipated as a result of the subdivision.

fire, or the lack of water, drainage, access, transportation, or other public services or that would necessitate an excessive expenditure of public funds for the supply of the services.